

CHEMICAL ABSTRACTS

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No. 13

I—APPARATUS

C. G. DERRICK

Air bubble viscosimeter. V. R. ABRAMS, J. T. KAVANAGH AND CHAS. H. OSMOND. *Chem. Met. Eng.* 25, 665-6(1921).—A glass tube, 21 cm. long and from 5.2 to 5.3 mm. in internal diam., with 2 lines etched on it 10 cm. apart near the middle of the tube, is sealed off at one end. The tube is filled with oil and closed with a tight-fitting glass cap which encloses a vol. of air which will fill 1.7 cm. of the tube when inverted. The time required for the bubble to pass between the 2 marks is proportional to the viscosity in Saybolt seconds and the "factor" may be obtained by calibration with a sample of known viscosity. Variations should not be over 1% for oils having a viscosity between 80 and 475 sec. Saybolt. The use of diams. other than those given or of an unretained bubble is impracticable and, therefore, water cannot be used for calibration. The caution is given that when oils are re-run repeatedly, the viscosity may change considerably.

EUGENE C. BINGHAM

Methods and apparatus used in the cryogenic laboratory. XVIII. Improved form of a hydrogen-vapor cryostat for temperature between -217° and -253° . H. K. ONNES AND C. A. CROMMELIN. *Proc. Acad. Sci. Amsterdam* 23, 1185-91(1922).—See *C. A.* 15, 3231.

E. J. C.

Determination of total nitrogen; apparatus for collecting the ammonia. Application to the determination of the albumins of milk. G. MELLÈRE AND DE SAINT-RAT. *J. pharm. chim.* 25, 100-3(1922).—A sketch is shown of a compact glass app. for the micro-detn. of N by Kjeldahl distn. with steam and subsequent titration. Detn. of total N in 5 cc. of milk with this app. is described.

S. WALDBOTT

Rapid extraction attachment. H. WOLFFRAM. *Chem.-Ztg.* 46, 93(1922). OSKAR HAGEN. *Ibid* 201. KURT SCHAEFER. *Ibid* 269.—*Ch. C. A.* 16, 1340.

J. H. M.

Safety devices for centrifugals. BERTHOLD BLOCK. *Chem. App.* 9, 72-3(1922).—References to Ger. patents.

J. H. MOORE

Wood-harry cleaner and concentrator. ANON. *Chem. Eng. Mining Rev.* 14, 142-3(1922).—A new type of concentrator for cleaning floated sulfide or other ores from gang and also for the primary flotation of sulfide ores has been developed at Mt. Lyell. The app. may also be used for cleaning fine coal or graphite. The concentrator consists of a series of atomizing wheels set in cells below the bottom of the box of the machine and driven at variable speeds by high-pressure water jets. Air is led into the cells so as to impinge on the blades of the wheels. Air bubbles generated by the wheels join those already in the primary froth or feed to the machine and so change the nature of the froth that it no longer holds the gang in suspension.

LOUIS JORDAN

A cell for the observation of colloidal solutions for use with substage ultra-condensers. FRED. FAIRBROTHER. *J. Am. Chem. Soc.* 44, 1071-2(1922).—With the app. described and shown in plan and section in the figure, a series of solns. or samples of the same soln. may be passed through the cell without disturbing the adjustment of the optical arrangement used.

H. M. McLAUGHLIN

The measurement of the internal diameters of transparent tubes. I. J. S. ANDERSON. *J. Sci. Instruments* 1922, Preliminary No., 24-7(1922).

E. J. C.

A special apparatus for the measurement at various temperatures of the Thomson effect in wires. H. R. NETTLETON. *Proc. Phys. Soc. London* 34, 77-85 (1922).—Values from test expts. are given for Fe and constantin wires. E. J. C.

The application of ion-concentration measurements to the control of industrial processes. E. A. KUEHLER. *J. Ind. Eng. Chem.* 14, 395-8 (1922).—A calomel cell-H₂ electrode app. suitable for plant lab. use is described. Among the processes and operations particularly adopted to control by this method are (1) carbonation of beet juice, (2) neutralization of pine-apple juice, (3) detn. of alky. of wool scouring liquor, (4) study of properties of tanning liquors and (5) regulation of p_H of boiler-feed waters. H. L. OLIN

Purple of Cassius found in bomb washings. RANDOLPH BOLLING. *Chem. Met. Eng.* 26, 871 (1922).—Colloidal Au was found in washings from a gold-lined bomb used in fuel work. After being used for 1500 detns., however, the lining was still in good condition. H. L. OLIN

The vapor pressure of sulfur dioxide and ammonia(BERGSTROM) 2. Thermostat arrangement for the determination of the effect of temperatures on diffusion (ÖHÖRM) 2.

Centrifugal separators. SHARPLES SPECIALTY CO. Brit. 175,121, Nov. 29, 1920. Three liquids of different densities are sepd. centrifugally and the distances of the contact surfaces of the stratified liquids from the center of rotation are controlled so that either of the contact surfaces of the intermediate liquid may vary substantially without varying its other surface. The separator may be used to sep. petroleum oil and wax with brine as a carrier fluid. A suitable construction is specified. Cf. C. A. 15, 1990.

Filter-tower for dry-cleaning gas. F. R. MCGEE and G. W. VREELAND. U. S. 1,413,126, Apr. 18; cf. C. A. 16, 514.

Retort for preparing activated charcoal. T. L. WHEELER. U. S. 1,413,146, Apr. 18.

Acetylene generator. P. B. SULLIVAN. U. S. 1,412,901, Apr. 18.

Acetylene generator. G. NORR. U. S. 1,414,320, Apr. 25.

Microscope for transparent materials. KIYOHICO HAGIWARA and TEB ASAHII GLASS KABUSHIKI KAISHA. Jap. 39,130, July 4, 1921. Diagrammatical description.

2—GENERAL AND PHYSICAL CHEMISTRY

• W. E. HENDERSON AND EDWARD MACK

The passing of two great Swiss chemists: P.-A. Guye and T. Sandmeyer. H. E. FERRZ. *J. Soc. Chem. Ind.* 41, 187-9R (1922). E. J. C.

• Philippe-A. Guye (1862-1922). V. *Schweiz. Chem.-Ztg.* 1922, 247-8.—An obituary. E. J. C.

Samuel Latham Mitchill—a father in American chemistry. EDGAR FAHES SMITH. *J. Ind. Eng. Chem.* 14, 556-60 (1922).—An address on the occasion of the presentation to Dr. Smith of the Chandler Medal. E. J. C.

The technical man as a citizen. ACHESON SMITH. *Chem. Met. Eng.* 26, 936-7 (1922).—An address. E. J. C.

Informational needs in science and technology. CHAS. L. REESE. *J. Ind. Eng. Chem.* 14, 364-8 (1922).—The great need and value of coordinated, available information are discussed with a broad point of view and the efforts and plans of the Natl. Research Council in its Research Information Service towards the fulfillment of this need are described. E. J. C.

The factor of safety in research. A. F. SHULL. *Science* 55, 497-505 (1922).—An address. E. J. C.

Recent researches on carbon monoxide. R. GIRARD. *Rev. sci.* 60, 195-7(1922).—A very brief review of recent work on the formation and detn. of CO. (See Desgrez *et al.*, *C. A.* 13, 3010; Kling and Florentin, *C. A.* 14, 823; Kohn-Abrest, *Technique sanitaire et municipale*, Apr. 1921, p. 88, *C. A.* 16, 1919. A. P.-C.

How one ten-millionth of a milligram is weighed. G. HEINEN. *Umschau* 26, 217-8(1922).—A description is given of Hans Petterson's improvements of the quartz balance devised by Steele and Grant (cf. *C. A.* 5, 1541). The older balance was very frail and difficult to manipulate. In place of the knife edge, the new balance has a pair of quartz threads. A test is made magnetically. The thinnest part of the quartz thread which is bent by the vibration of the balance is only one thousandth of a mm.; it is invisible to the naked eye and by side illumination appears as a spectral color, yet its tensile strength is remarkable. The beam is of quartz, 5 cm. long and weighs a fraction of a g. Vibrations are read by mirror and scale. A load for the balance is 0.1 to 0.2 g., and the ordinary sensitiveness one millionth of a mg. The balance is mounted in a container from which the air is readily exhausted. I. W. RIGGS

The comparative values of different specimens of iodine for use in chemical measurements. C. W. FOULK AND SAMUEL MORRIS. *J. Am. Chem. Soc.* 44, 221-9(1922).—The comparison of samples of I_2 of at. wt. purity with samples purified in ordinary ways is made by titration with $Na_2S_2O_3$ in specially designed titration flasks. With the exception of 2 samples, the low value for which is accounted for by the presence of H_2O , the agreement with the at. wt. I_2 is within 0.02%. I_2 is not hygroscopic enough to affect analytical work. G. W. STRATTON

Latent polarities of atoms and mechanism of reaction, with special reference to carbonyl compounds. ARTHUR LAPWORTH. *Mem. Manchester Phil. Soc.* 64, [iii] 1-16(1920).—A group such as NH_2 which tends to lower the acidity of a mol. is called "basylous"; one such as CH_3CO , which has the opposite effect, is called "acylous." The groups NH_2 , $NHAlk$, etc., are basylous, but almost invariably exhibit negative polarity when attached to C; H is basylous and usually positive; CO, SO_2H , and NO_2 are strongly acylous and usually positive; while OH, $OAlk$, etc., are acylous and negative. Halogens are acylous and normally negative, but positive when contrasted with OH or NH_2 . Comps. contg. positive acylous groups yield acids by union with negative hydroxyl (for example, CH_3CO), and those with negative basylous groups (for example,

NH_2) yield bases with positive H (or $H + H_2O$). Atoms in reactive mols. may be labelled with + or - signs, although these are not intended to denote elec. charges, but merely indicate the relative polar characters which the two atoms seem to display at the instant of chem. change. Thus, the addn. of electrolytes to the carbonyl group invariably proceeds as if the C atom were more positive than the O atom, and selected

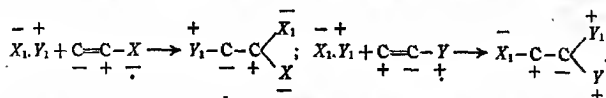
the negative ion:
$$>\overset{+}{C}:\overset{-}{O} + \overset{+}{CN}\cdot H \longrightarrow >\overset{+}{C}(CN) - \overset{-}{OH}.$$
 The aldol reaction*, in which comps. contg. the groups $>CH\cdot CO-$, $>CH\cdot NO_2$, $>CH\cdot CN$, etc., replace HCN above, suggests an enhanced positive polar character of the H atom relative to the

C atom on which it is situated; this is indicated as follows:
$$\begin{array}{c} + \\ | \\ >\overset{+}{C} - \overset{-}{C} = \overset{-}{O}. \end{array}$$
 Evidence

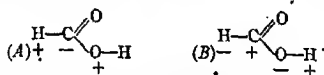
for the existence of latent polarization in the 2 C atoms is adduced. The carbonyl group, therefore, tends to develop alternate - and + polarities in a chain of atoms. The order of alternating latent polarities is detd. by the O atom or atoms; in nitriles by the N atom. The "key-atom" is indicated by the addn. of a dot to the sign of polarity:
$$\begin{array}{ccccccc} C & \cdot & C & + & C & = & O; & C & - & C & - & N \equiv O_2; & C & - & C & - & S \equiv O_2; & C & - & C & - & C \equiv N. \end{array}$$
 Biva-

alent O and tervalent N (negative) are much more effective in producing such al-

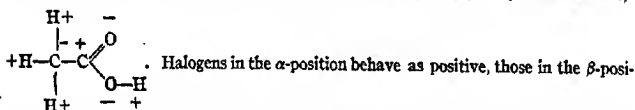
ternations of polarity than halogens, and the influence of the O is usually greater than that of the N. A perceptible influence of the opposite kind seems to be exercised by H; C and quinquivalent N appear to be nearly indifferent. The extension of the influence of the key-atoms over a long range requires for its fullest display the presence of double bonds, usually in conjugated positions. The above rule is called the "principle of induced alternate polarities." Markownikoff's rule is readily explained:



Heterogeneous arrangements arise when two isodynamic phases of the mol. can be induced by different key-atoms:



In homogeneous arrangements the effect is the same no matter which of the O or H atoms is regarded as the key-atom (for example, acetic acid; ethyl acetoacetate):



tion as negative, groups. The relative acidities of the 3 isomeric cresols are explained. The principle of induced alternate polarities is considered in conjunction with free, partial, and latent valencies, and conjugation. Reference must be made to the original for schemes of reaction illustrating the application of these principles. J. C. S.

Theoretical derivation of the principle of induced alternate polarities. A. LAPWORTH. *J. Chem. Soc.* 121, 416-27 (1922).—Consideration of a great variety of data indicates that induced alternate polarities in a chain of atoms frequently become manifest which cannot be explained by the "migration" of a "whole" free valency. However, by the extension of conceptions similar to those put forward in a previous paper (cf. preceding abstr.) to include the migration of "partial" valencies with polar characters, a general explanation which is consistent with modern electronic views has been constructed. It is assumed that (1) each atom in its org. chem. combination can be associated with a given (max.) no. of bonds or valency lines; (2) while no atom can have more than this no. it may have less; (3) the total no. of these valency lines (whole + fractional) in any part of a mol. remains const., unless there is a definite reason to postulate that some have passed to or from another part of the mol. or to or from the surroundings. In order to limit the great variety of modes in which valencies may be readjusted after a disturbance, the following "simplifying factor" is introduced: When any disturbance takes place in the no. of shared or free valencies which are associated with an atom in its normal state of combination, then a constraint is usually set up and the atom strives to regain its normal condition. This may lead to a redistribution of valencies elsewhere; but in the consequent changes due to the propagation of the strain along any part of the mol. the strains at all points in that part taken together cannot exceed the original constraint in that part. The adjustments which a mol. in its normal or "resting" state may undergo due to "constraint" or "strain" are considered, and it is shown that they are (1) such as have only "virtual" valencies and these on the "odd" atoms only; (2) such as have only new real "free" valencies and these on the

"even" atoms only; (3) such as have only real "free" valencies and these on the "odd" atoms only; (4) such as have only "virtual" valencies and these on the "even" atoms only. ("Virtual valency" is defined by the statement that the sum of the "real" and "virtual" valencies attached to any atom in its org. chem. combinations is equal to the usual max. valency of the atom.) The more obvious possible causes of constraint appear to be: (a) absorption of thermal or radiant energy, leading in the 1st instance to redistributions of at. attachments, usually at the atoms with variable co-valencies; (b) ion formation, by dissocn., at the "key-atom"; (c) ion formation by association, as, for instance, by the formation of a complex ion by union of the mol., at the key-atom, with a simple ion; (d) non-ionic association with other uncharged mol.s.; (e) tendency to certain mol. distributions of affinity. A no. of interpretations of the principle of induced alternate polarities based on modern electronic views of valency are put forward. On the assumption that the "negative key-atom" of a mol. is operating in virtue of a tendency to a variation in the no. of electrons which it shares with the adjacent atom, it is surmized that (a) the key-atom should be an atom with a variable co-valency; (b) under certain conditions (which are given) the key-atom should be an atom which readily falls in co-valency; (c) under other conditions (described) the key-atom should be an atom which rises in co-valency; (d) the key-atom should in any case be an atom which, when it varies in co-valency, adheres strongly to its electrons. Atoms of O and N have properties (a), (b) and (c) to a well marked degree in their bivalent and trivalent states, while the halogens exhibit similar properties, but to a less marked degree. In conclusion, the following points are emphasized: (1) that while the interpretation of a partial valency can be reconciled in the most striking manner with present-day formulas and reactions as pictured by org. chemists, it would be premature wholly to abandon the force-field view, which is clearly related to it and which in some cases seems better fitted to account for the facts; (2) that it is not a mere weakening or strengthening of the bond that det. the order of the induced polarities in a chain and consequently the modes in which the atoms in the chain react, but rather, whether or not the excess (or defect) in the bond is made up from (or passes to) the chain itself. For schemes of reactions and diagrams illustrating the principles discussed, reference must be made to the original paper.

H. JERMAIN CRRIGHTON

Space formulas. F. RINNE. *Z. physik. Chem.* 100, 408-18(1922).—A diagrammatic representation of a no. of different mol.s. is presented on the basis of the assumption of close packing. New values have been calcd. for the diam. of the "at. domain" of the alkali and alk. earth metals and the halogens. From these values the at. vols. of the halides of K and Rb have been calcd. The construction of the mol.s. of O, N, CO, CO₂, Cl and Br is indicated, and the diam. of the "domain" of these mol.s. calcd.

H. JERMAIN CRRIGHTON

The crystal structure of ammonium fluosilicate. R. M. BOZORTH. *J. Am. Chem. Soc.* 44, 1066-70(1922).—By Laue photographic and spectrographic data it is shown that NH₄ fluosilicate has the same structure as NH₄ chloroplatinate; this structure is analogous to that of CaF₂, if NH₄ groups replace fluorine atoms and fluosilicate groups take the place of Ca atoms. The length of the side of the unit cube is 8.38 Å.; the parameter defining the positions of the fluorine atoms was detd. to be 0.205.

R. W. G. W.

The crystal structures of aragonite (CaCO₃) and related minerals. M. L. HUGGINS. *Phys. Rev.* 19, 354-62(1922).—A structure is proposed for aragonite which is in accord with all observed facts. As in calcite, each C atom is bonded (by double bonds) to 3 O atoms, each O to 2 Ca and 1 C, and each Ca to 6 O, at the corners of an irregular octahedron. Certain principles of cleavage are discussed in relation to this structure. The dimensions and interatomic distances in the isomorphous minerals

strontianite, witherite and cerussite, which are assumed to have similar structures, are computed.

RALPH W. G. WYCKOFF

The crystal structure of quartz. M. L. HUGGINS. *Phys. Rev.* 19, 363-8(1922).—By means of the Lewis theory, a structure has been obtained for quartz which accounts in a satisfactory way for the cryst. form, crystal symmetry, optical rotation, hardness, high m. p., insoly. and X-ray spectra of the substance. It is in strict accord with the conclusions of W. H. Bragg in regard to the structure.

RALPH W. G. WYCKOFF

The crystal structures of marcasite (FeS_2), arsenopyrite (FeAsS) and loellingite (FeAs_2). M. L. HUGGINS. *Phys. Rev.* 19, 369-73(1922).—The arrangement of atoms and valence electrons, which is consistent with all known exptl. facts, is proposed for marcasite. The arrangement around each atom is very similar to that in pyrite. Assuming the same general arrangement for arsenopyrite and loellingite as for marcasite, the dimensions of the unit cells are obtained.

RALPH W. G. WYCKOFF

The space lattice structure of the alkaline earth oxides. WALTHER GERLACH. *Z. Physik* 9, 184-92(1922).—Using the powder photographic method of Debye and Scherrer the following values were obtained for the edge length of the unit cube (all have the NaCl type of lattice): BeO 3.796 \pm 0.00; MgO 4.220 \pm 0.02; CaO 4.768 \pm 0.05; SrO 5.104 \pm 0.01; BaO 5.496 \pm 0.02. BeO showed some anomalous intensities which could not be explained.

G. L. CLARK

Densities and molecular volumes of the oxides of lanthanum, praseodymium, neodymium, samarium and europium. WILHELM PRANDTL. *Ber.* 55B, 692-4(1922).—The values of d^{16}_4 for the pure oxides prepared from the oxalates by ignition are as follows: La₂O₃ 6.51, Pr₂O₃ 6.71, Pr₂O₃ 6.87, Nd₂O₃ 7.24, Sm₂O₃ 7.43, Eu₂O₃ 7.42 and Gd₂O₃ 7.407. The corresponding mol. vols. omitting Pr₂O₃ are 50.08, 48.01, 46.49, 46.95, 47.44 and 48.95.

G. L. CLARK

The properties of elements and salts as related to the dimensions of atoms and ions. G. L. CLARK. *Science* 55, 401-5(1922).—A large number of properties of the elements and salts are found to be linearly related to the dimensions of the atoms and ions, particularly in Groups O, I, IV and VII of the periodic system. Some properties of compds., notably mol. vols., are related to the dimensions of the 2 series of atoms or ions comprising the mol. by surfaces, some nearly plane and all doubly ruled. The equations of the surface of mol. vols. of the alkali halides related to the at. vols. of alkali metals and halogens are given. The anomaly of the Cs salts is found to reside entirely in the different crystal lattice since in the molten state these salts are entirely normal with respect to the other alkali halides. At. and ionic radii of the alkali metals and halogens calcd. from a large number of assumptions are tabulated and critically considered.

G. L. CLARK

The distances between molecules. R. GANS. *Physik. Z.* 23, 108-13(1922).—This paper is purely mathematical. Use of the theory of probability yields an expression for the distances in a random distribution of particles. The feature of the discussion is the extension to the case in which the vol. of the particles is taken into account is an approx. formula for the av. distance is $R = 0.5339/\sqrt[3]{\pi} \times [1 + \frac{1}{2} \gamma - 2.114\gamma^{1/4}]$, in which π is the no. of particles in unit vol. and γ is the ratio of the vol. of the particles to the total vol. For dil. gases where γ can be neglected this reduces to a well known formula.

E. D. WILLIAMSON

The Brownian movement in gases. I. New experimental investigation. E. SCHMID. *Sitzb. Akad. Wiss., Wien* 129, IIa, 813-60(1920); *Science Abstracts* 25A, 16.—Following the theoretical investigations of the Brownian movement by Einstein and Smoluchowski, which led to identical results by quite different methods, a quantitative investigation was undertaken by Ehrenhaft for gases. Smoke and Ag particles were observed in air and the animation of the Brownian movement was found to be of the

character expressed by the Smoluchowski formula. De Broglie endeavored to photograph the paths of the particles, but this was limited to definite dimensions, although in a succeeding investigation [*C. A.* 3, 1836] he utilized this method for detg. the magnitude and charge of smoke particles. The paper contains a review of work by Weiss, Millikan, Fletcher, Ehrenhaft, Parankiewicz, and Sneath. One group of authors asserts that the motions of particles due to the resistance laws and to the Brownian movement are in complete agreement with those of spherical-shaped objects of given d . The second group of authors finds both motions to deviate from each other, and for metals and oil in opposed directions. A recent investigation on Hg and oil particles by Fürth appears to support Ehrenhaft. The present paper has for its object a new exptl. investigation, suggested by Ehrenhaft, of the apparent dependence of the Brownian movement on the masses of the particles by using substances of av. d . Jäger has investigated the subject theoretically, and finds only very small dependence upon mass. A full description of the exptl. arrangements is given, following which comes a calcn. of the vertical and horizontal displacement squares with accompanying investigations of possible errors. This part of the paper is mathematical. The exptl. data are then discussed at great length, tables of results being included. So was the substance chosen, and this was sublimed in a slow current of N. By variation of the mode of beating, particles of different dimensions could be produced. The particles could be charged by means of a radioactive prepn., and the times of descent and ascent in gravitational and elec. fields, resp., were ascertained. The non-dependence of the Brownian movement on external forces was established by comparison of the vertical and horizontal squares of displacement. An appendix is included, containing very complete app. details. H. G.

Experiments on thermal diffusion; confirmation of Chapman's theory. T. L. IBBS. *Proc. Roy. Soc. London* 99A, 385-95(1921); *Science Abstracts* 24A, 794-5.—It has been shown by Chapman and Dootson both theoretically and experimentally (*C. A.* 11, 1927), that a temp. gradient applied to a uniform mixt. of two gases will cause a sepn. of the gases, the smaller and lighter mols. diffusing towards the hotter side ("thermal diffusion"). Expts. are now described in further confirmation, by a new method, of Chapman's theoretical work. The gas used was a mixt. of various proportions of H and CO₂. The gases were analyzed, before and after thermal diffusion had taken place, by means of a "katharometer," the action of this instrument depending on differences of thermal cond. of gases or mixts., of gases. The max. sepn. obtained in the expts. was 3.52% for a mixt. of 61% H and 39% CO₂ for a temp. difference of 557°. The amt. of sepn. was found to be proportional to $\log T_1/T_2$, where T_1 and T_2 are the abs. temps. forming the temp. gradient. This is in agreement with Chapman's formulas. S. CHAPMAN. *Ibid* 396-7.—Ibbs's expts. (cf. above) are found to agree with the theoretically predicted formula: $k_t = (0.331\lambda_1 + 0.0542\lambda_2)/(47.2 + 86.5\lambda_{1,2} + 5.58\lambda_{2,1})$, where k_t is the coeff. of thermal diffusion, λ_1 , λ_2 are the percentages by vol. of CO₂ and H, resp., $\lambda_{1,2} \equiv \lambda_1/\lambda_2$ and $\lambda_{2,1} \equiv \lambda_2/\lambda_1$. The abs. amt. of sepn. found by Ibbs is a good deal less than that required by the theory, which was deduced, however, on the assumption that the mols. are rigid elastic spheres. H. G.

The science of colloids and its importance. I. TRAUBE. *Chem.-Ztg.* 46, 301-2 (1922).—A review. H. M. MCLAUGHLIN

A centrifugal method for preparing colloidal ferric hydroxide, aluminium hydroxide, and silicic acid. RICHARD BRADFIELD. *J. Am. Chem. Soc.* 44, 965-74(1922).—Hydro-sols of hydrous Fe₂O₃, Al₂O₃, and SiO₂ of unusually high purity can be prepd. by pptg. the oxides by addn. of NH₄OH to the corresponding chlorides or HCl to Na silicate, resp., and very thoroughly washing the ppts. by decantation until they begin to become colloidal. They are then suspended in water and passed through a Sharples Super-centrifuge operating at 32500 r. p. m. The deposit is repeatedly suspended in water and

centrifuged. The lower half of the contents of the bowl is then stirred up in water, giving a hydrosol, Sol A, the upper half similarly giving Sol B. The liquid discharged from the centrifuge on the fourth and subsequent washings is Sol C. Analysis of one of the Fe_2O_3 sols showed 396 g. equiv. Fe_2O_3 per g. equiv. Cl^- . The SiO_2 sols are free from Cl^- . The sols are very stable; even Sol A, which contains the largest particles, gave no sepn. on 20 min. centrifuging at 2000 r. p. m. On boiling the sols may be reduced almost to sirupy consistency without coagulating. When $\text{Al}_2(\text{SO}_4)_3$ is pptd. by NH_4OH the ppt. can be peptized by this method, showing that SO_4^{--} does not ppt. the sol irreversibly as heretofore supposed. SiO_2 sol free from electrolytes has $\text{pH} = 6.5$.

F. L. BROWN

The physical chemical study of colloidal sulfur. G. ROSSI. *Kolloid-Z.* 30, 228-30 (1922); cf. *C. A.* 7, 437.—The colloidal S was prepd. from $\text{Na}_2\text{S}_2\text{O}_3$ and H_2SO_4 and consequently contained much Na_2SO_4 and H_2SO_4 . These electrolytes can be removed in large measure by dialysis, but cannot be completely removed without causing coagulation of the sol. The elec. cond. and f.-p. depression of the hydrosol are much less than they are for a soln. contg. the same amts. of Na_2SO_4 and H_2SO_4 but no S. As the sol is dialyzed, the magnitude of the change in cond. and f.-p. depression caused by the presence of the S greatly decreases, but when Na_2SO_4 and H_2SO_4 are added to the dialyzed sol these fresh additions affect the cond. and f.-p. depression as greatly as they would pure water. If this addn. restores the original ratio of S to electrolytes, the sol is no longer stable, but coagulates. Conclusion: The colloidal S affects the physical state of the Na_2SO_4 and H_2SO_4 in the sol only when the electrolytes are present at the moment when the colloidal phase is formed.

F. L. BROWN

Cataphoresis of colloidal carbon. STEPHANIE GOLDBERG. *Kolloid-Z.* 30, 230-4 (1922).—The colloidal C was prepd. by the action of H_2SO_4 on cane sugar and dialysis until the elec. cond. fell to 23×10^{-4} mho. and BaCl_2 gave no test for SO_4^{--} . The velocity of migration to the anode was measured in Coehn's app. and found to vary from 12 to 25×10^{-4} cm./sec./volt. In very concd. sols the velocity was very small, increasing with diln. rapidly to a max. Passing the sol through filter paper increased the velocity about 10%. Addn. of acids or bases lowered the velocity considerably. With addn. of $\text{Al}_2(\text{SO}_4)_3$ the velocity passed through a max. of 33×10^{-4} cm./sec./volt at $N/500,000$. Dyestuffs such as crystal violet, auramine, and methylene blue and ferric oxide hydrosol decreased the velocity to 0 and in sufficient concn. caused coagulation.

F. L. BROWN

Electroosmosis. PAUL BARY. *Chimie et industrie* 7, 640-50 (1922).—A review, with bibliography, of the applications of electroosmosis to industrial processes. Also in *Chem. Trade J.* 70, 625-7 (1922).

A. P.-C.

Capillary-electric phenomena in lyophile sols. H. R. KRUYT AND H. G. DE JONG. *Z. physik. Chem.* 100, 250-65 (1922).—Agar sols obey Poiseuille's law above the temps. at which gelatinization takes place. The sols exhibit Smoluchowski's quasi-viscous effect. Discharge of the agar particles takes place at concns. which correspond to the valence of the added cations. The elec. behavior of the sols is comparable to that of a suspensoid. The emulsoid sol possesses 2 stability factors, elec. charge and hydration, both of which must be taken into consideration if it is desired to bring about flocculation. If only the charge is removed, a lyophile sol remains, while if hydration alone occurs a suspensoid results. Salting-out combines discharge and hydration. Albuminoid substances do not form ion-disperse solns., but colloid-disperse sols. H. J. C.

Antagonistic ion effects. WIDAR BRENNER. *Hyllningskrift tillägnad Ossian Aschan 1920*, 36-44.—Expts. were carried out on cabbage leaves to show that the coagulation of a negative, hydrophilic colloid by H ions is counteracted by certain neutral salts. The cations investigated, in the presence of Cl^- anion, have a counteracting in-

fluence in the following order: $\text{Ca} > \text{Mg} > \text{K} > \text{Na}$. In connection with the NO_3 ions the Ca-ion effect is greatly diminished and Mg and K-ion effects are nil. C. E. C.

The theory of Liesegang's rings. M. H. FISCHER AND GRO. D. McLAUGHLIN. *Kolloid Z.* 30, 13-16(1922).—Theoretical study of conditions under which the formation of Liesegang's rings is possible. The rings are formed when one of the constituents can form a temporarily semi-permeable membrane which subsequently becomes permeable. The manner in which this can occur, and the structure and behavior of such membranes are considered at some length. H. W. BANKS, 3RD

Absorption experiments with sphagnum moss. R. STIGELL AND BERTEL GREITLIN. *Hyllningskrift tillägnad Ossian Aschan* 1920, 84-91.—Expts. with a sphagnum moss and CaCl_2 soln. show that: (1) sphagnum moss has a strong absorption power for lime; (2) the absorption increases with the concn. of the soln. until a max. is reached (the earth is then satd. with lime and will not take up any more of it, even if the concn. is greatly increased); (3) sphagnum moss in contact with dil. CaCl_2 soln. holds considerable water in combination. The amt. of this combined water is approx. 4-6 g. per g. of dry soil. C. E. CARLSON

Electroadsorption as a purely chemical phenomenon. WO. OSTWALD. *Kolloid-Z.* 30, 254-60(1922). This is a discussion of Kolthoff's paper under this title, *C. A.* 16, 1352.—Although adsorption due to the existence of a chem. potential at an interface is always possible, K's. theory postulates in addn. an elec. adsorption and hence is not "purely chem." The development of the adsorption formula on the basis of the law of mass action can yield practical results only when in place of the stoichiometric mass of the adsorbent there is substituted the active mass, which consists of the sum of the chemically active surface layers. The active mass can be obtained by multiplying the stoichiometric mass by a proper fraction whose magnitude depends upon the size of the particles of adsorbent (*i. e.*, on the sp. surface) and becomes unity for mol. dispersions. In applying the theory of soly. product a similar factor must be employed to take care of the increase in soly. with decrease in size of particle. The proportionality between the exponent $1/n$ in the adsorption formula and the valence of the adsorbed electrolyte claimed by K. is not confirmed by expt. F. L. BROWN

The theory of the migration velocity of particles in a viscous medium when acted on by an external force. H. F. MAYER. *Jahrb. Radioakt. Elektronik* 18, 201-39 (1921).—A review of the formulas proposed to express the migration velocity of particles in a field of force surrounded by a viscous medium. General formulas are considered, also formulas for the migration of electrons in metals and of electrolytic ions in water. Modified forms based on specified assumptions are given. The applicability of the Stokes-Kirchoff law is discussed. A. E. STEARN

Thermostat arrangement for the determination of the effect of temperature on diffusion. L. W. ÖRÖLM. *Hyllningskrift tillägnad Ossian Aschan* 1920, 9-17.—The thermostat was a rectangular Cu vessel with glass sides. The circulation was maintained by a propeller driven by an electric motor supported so as to prevent any shaking of the thermostat. Temp. regulation was maintained const. at $\pm 0.15^\circ$. Expts. were carried out with KCl and sugar soln. 0.25 *N*, 0.5 *N* and *N*. Previous work has shown that the temp. diffusion coeff. is probably a function of the difference coeff.; $\alpha = A + B \log k$, where α is temp. coeff., *A* and *B* const., *k* the diffusion coeff. For KCl the av. value of α was 0.025 between 13.5° and 29.5° and for sugar the av. value of α was 0.033 between 13.7° and 28.7° . C. E. CARLSON

Nature of the breaking process. M. POLANYI. *Z. physik* 7, 323-7(1921).—Since *A*, the work necessary to pull apart a rod, must be greater than the surface energy of the two new surfaces formed and less than the product of the tensile strength *Z*, the cross section *q*, and the elongation at breaking ΔL_0 , it follows that $Zq\Delta L_0 > 2\sigma q$ in which

σ is the surface tension of the solid. Taking Z , along a principal axis and normal to a (100) plane of a NaCl crystal, as 7×10^7 dynes/cm.² and σ as > 150 dynes/cm. (the surface tension of liquid NaCl at 0° obtained by extrapolation), ΔL_0 must be greater than 500×10^{-8} cm. and not 3×10^{-8} cm. as according to the elec. crystal lattice theory of Born and Landé. P. explains this inconsistency by assuming that the expansion of the NaCl rod under tension proceeds according to the laws of mechanics until at a certain elongation a quantum jump (Quantensprung, Atomsprung) suddenly takes place which brings about the separation of the rod with the production of two new surfaces. This can only take place when the expansion energy accumulated in the crystal is sufficient to supply the energy necessary for the formation of the surfaces or when $A > 2\sigma q$. A is shown to be equal to $Z^2 L_0 q / 2E$, in which E is the modulus of elasticity. It follows that $Z^2 L_0 / 2E > 2\sigma q$. This last relation defines a lower limit for Z which, remarkably, is inversely proportional to $\sqrt{L_0}$. Substituting the values given above for Z and σ , and putting $E = 5 \times 10^{11}$ dynes/cm.², $L_0 > 0.6$ cm. for normal values of the consts. Abnormal values of tensile strength have been found when $L_0 < 0.1$ cm., thus confirming the quantum theory of the breaking process.

D. MACRAE

Ordered crystal growth. M. VOLMER. *Z. physik* 9, 193-6 (1922); cf. C. A. 16, 868, 1686.—The possible explanations for the fact that Hg crystals grow 1000 times as fast in 2 directions as would be predicted from the equation developed in former papers are considered. The conclusions are fundamentally those of Langmuir of nucleus building from adsorbed and oriented mols. and large free surface energies.

G. L. CLARK

Thin layers formed by mixtures of glycerides. Mlle. PAULE COLLET. *Compt. rend.* 174, 544-45 (1922).—The association of mixts. of pure triglycerides was studied by prep. benzene solns. of known concn. of pure triglycerides and from them a series of mixts. of known volumetric proportions. The surface area of water covered by a const. vol. of these mixts. was then measured and plotted as a function of the compn. of the mixt. The curves obtained were never straight, and in consequence the law of association of two glycerides in the same thin layer is not purely an additive one. The graphs show either a max. or a min. which is in all cases clearly defined. When one of the mixed glycerides is a solid and the other a liquid the change in physical state of the thin layer is produced at the level of the max. or of the min. The difference between the ordinate of one of these points and the ordinate that one would measure upon an upright joining the extremes of the curve can become as great as 32% of the initial surface. (mixt. of trimyristin and trilaurin). Furthermore in mixts. corresponding to a max. or a min. of surface covered, the numbers of mols. of glycerides are in simple ratios to one another. This ratio is equal to 3 for the mixts. tribenzoin-trilaurin and trilaurin-trimyristin, which both give place to a min. of surface. For the mixt. trimyristin-tripalmitin the ratio is near 1; the two mixts. tribenzoin-tripalmitin, and tribenzoin-trimyristin give a ratio equal to 4 when covering a max. of surface. During the solidification of a glyceride in a thin layer it seems that identical mols. associate with one another 4 by 4. The preceding results suggest the probability that in a mixt. mols. chem. different group themselves in a simple manner, their association being characterized by an extension max. or min. upon the surface of the water. Also in *J. phys. radium* 3, 128-32 (1922).

J. T. R. ANDREWS

Corresponding states of surface tension. RICHARD LORENZ AND W. HERZ. *Z. anorg. allgem. Chem.* 120, 320-6 (1922).—Expanded from the Eötvös expression the ratio $\gamma_s/\gamma_e = [1 - (T_s/T_e)] / [1 - (T_e/T_e)] (V_e/V_s)^{1/3}$, where γ is surface tension, V mol. vol., T the abs. temp. and the subscripts s and e resp. b. p. and m. p., is equal to 0.578 theoretically. Exptl. values of Jaeger give an av. of 0.53 for 81 org. liquids and 0.58 for 21 inorg. salts. The b. ps. of several salts such as fluorides are calcd. from the surface tensions and mol. vols.

G. L. CLARK

Adhesion forces in solution. II. Studies on adhesion series: N. SCHULOW. *Z. physik. Chem.* 100, 425-62(1922); cf. *C. A.* 14, 1775.—The earlier work has been extended considerably. A large no. of adsorbents have been investigated systematically for the purpose of detg. whether in the adsorption of electrolytes by different adsorbents electrolyte series exist which are similar to those observed in the case of C adsorption, and whether such series possess any resemblance to the adsorption series. The following adsorbents have been investigated: Al_2O_3 , Fe_2O_3 , MnO_2 , peat, wool, finely divided metals, mastic sol, $Fe(OH)_3$ sol, MnO_2 sol, As_2S_3 and Sb_2S_3 sols, suspended C (KOH and tannin soln.) and suspended Fe_2O_3 (HCl soln.). A large no. of inorg. and org. salts and acids have been used as the electrolytes. Series exist which are completely analogous in general form for both homogeneous and heterogeneous systems. The anion series are either convalent or antivalent. The former is usual for positively charged sols (or adsorbents) and for processes taking place in alk. soln.; the latter for negatively charged sols (or adsorbents) and for processes occurring in acid soln. However, this rule is not of general importance since, e. g., MnO_2 as adsorbent furnishes a convalent series and as sol an antivalent series. The form of the series is detd. not only by the sign of the adsorbent, but also by the nature of the electrolyte and the solvent, i. e., by the collective properties of the system. Some series can be reversed readily merely by small addns. to the solvent. The cation series are mostly convalent and are apparently independent of the sign of the adsorbent or colloid. There exist mixed cation series which may be regarded as constituting transition types from the convalent to the antivalent series. Three kinds of mixed series have been observed which commence with either uni-, bi- or tervalent ions. The H ion usually stands on the border of the groups of bi- and multivalent ions or in the middle of the group of the latter kind of ions. Its position is independent of whether these groups exert a relatively strong or weak influence in comparison with the remaining ions. On the other hand, the position of the H ion is detd. by the boundary of the groups of uni- and bivalent ions. At all events it is not possible to ascribe to the H ion an unqualified stronger influence than to the other cations, as is often done in the field of colloidal chemistry. Besides the possibility of different orientations of entire series, inversions in the domain of single groups are also possible. Additive behavior of the ions is not a general characteristic of the series. In addition to the general types of convalent, antivalent and mixed series, the following individual peculiarities of structure in the different series have been observed: (a) Some series are divided into sharply differentiated groups of ions according to their valence, individual ions having the same valence differing in their action but slightly from one another. Such series enter into colloidal processes. (b) With other series the chem. properties of the ions are the detg. factor, the whole series having a similarity to electromotive series. These series are of use for adsorption processes and for heterogeneous chem. reactions. (c) A peculiar case has been observed in which soly. in 2-phase systems appears to depend on the at. vol. of the ion-forming elements. In conclusion, adhesion series are discussed from the theoretical standpoint. H. J. C.

λ -V-curves in non-aqueous solutions of binary electrolytes. P. WALDEN. *Z. physik. Chem.* 100, 512-31(1922).—The viscosity and vol. corrections that have been proposed for the equiv. cond. (λ) of electrolytes are discussed. These corrections do not exhaust the possible causes of anomalous λ values at high concns.; solvation of the ions, its change with diln., change in dissoc. due to variation of the dielec. in consequence of the presence of the solute, change in ionic mobility, etc., must also be taken into consideration. All of these factors, in conjunction with the chem. nature of the solute, give rise to anomalous cond. values, i. e., to increase in mol. cond. with increasing diln. By means of cond. data for solns. of $N(C_2H_5)_4I$, $N(C_4H_9)_3HCl$, $N(C_2H_5)_3HCl$, KI and $AgNO_3$ in non-aq. solvents, it is shown that the vol. corresponding to the min. λ value

is given by the expression $V_{\text{min.}} = (\text{const.}/\epsilon)^2$, where ϵ is the dielec. const. The value of the const. in this expression varies with the nature of the solute between 33 and 38 and has a mean value of 36.

H. JERMAIN CRIGHTON.

Calculation of the osmotic and activity functions in solutions of uni-univalent salts. J. M. BRÖNSTED. *J. Am. Chem. Soc.* 44, 938-48(1922); cf. *C. A.* 16, 1898.—Equations have been developed to govern the osmotic and activity functions of uni-univalent salts in pure and mixed solns. These equations are strongly supported by exptl. data. Ratios of activity coeffs. are calcd. by means of the equations in conjunction with the principle of the sp. interaction of ions.

H. JERMAIN CRIGHTON.

Calculation of the second dissociation constant of dibasic acids. MARCEL DUBOIX. *J. chim. phys.* 19, 179-87(1921).—Noyes' formula for the second dissociation const. of a dibasic acid $K_2 = [H^+]^2(C + K_1 + [H^+])/K_1(C - [H^+])$ is inapplicable to solns. more dil. than 0.001 molal. Even in more concd. solns. it yields values too high, which, however, decrease with increasing diln. A formula giving better results is derived. This has the form $K_2 = [H^+]/([H^+] + K_1 - a)/(2a - K_1)$ where $a = K_1[C - S(1 - \alpha)]/[S(2\alpha - 1) + [H^+]]$, C being the total molal concn. of the acid, S that of the alkali added, and α the degree of ionization of the alkali. This is applicable to concns. between 0.01 and 0.005 molal. For high dilns. it is possible by measuring the hydrogen-ion concn. of a soln. of the pure acid to calc. K_2 from the relation $K_2 = \{[H^+]/([H^+]^2 + K_1[H^+] - CK_1))/K_1(2C - [H^+])$. This applies only to very dil. solns., 0.001 to 0.0002 molal, for when the concn. is much greater the H ion is due practically entirely to the first ionizable H. The following revised values for $K_2 \times 10^6$ are obtained: Tartaric at 25° = 32, at 76° = 28.4; malic at 100° = 4.1; succinic at 25° = 2.5; at 100° = 1.5.

A. E. STEARN

Dissociation and hydrolytic equilibria in solutions of salts of carbonic and boric acids. H. MENZEL. *Z. physik. Chem.* 100, 276-315(1922).—Both the electrometric and colorimetric methods have been employed in studying the equil. The mean of the values obtained by the 2 methods for the second dissociation const. (K_2) of H_2CO_3 at 18° is 6.2×10^{-11} . From this value 1.03×10^{-4} is obtained for the second hydrolytic const. of the acid. Electrometric measurements with dil. $Na_2B_4O_7 \rightarrow NaBO_2$ give the value $K_B = 5.7 \times 10^{-10}$ for the dissociation const. of HBO_2 . This value is considerably smaller than that obtained by Walker, but agrees with the values detd. by Lundberg by the catalytic method and by Lundén by the condensation method. This gives a value 1.12×10^{-2} for the hydrolytic const. Owing to the formation of polyborate ions, concd. $Na_2B_4O_7 \rightarrow NaBO_2$ mixts. have an alkalinity greater than that corresponding to this value for the hydrolytic const. The equil. $2Na_2CO_3 + 4HBO_2 \rightleftharpoons 2NaHCO_3 + Na_2B_4O_7 + H_2O$ at high dilns. has been studied theoretically and exptl., and it is shown that the equil. borax-bicarbonate \rightleftharpoons boric acid-carbonate and borax-carbonic acid \rightleftharpoons boric acid-bicarbonate can be disregarded. The possibility of the equil. metaborate-carbonic acid \rightleftharpoons bicarbonate-borax is discussed.

H. JERMAIN CRIGHTON

Acidifying influence of hydroxyl-containing organic substances on boric acid and molybdic acid. E. RIMBACH AND P. LEY. *Z. physik. Chem.* 100, 393-407(1922).—The influence of the org. hydroxyl compd. on H_2BO_3 and H_2MoO_4 has been studied by detg. the relative increase in the H-ion concn. over the additive calcd. value brought about by the addn. of the org. compd. The following OH compds. were used, with each of the mineral acids: the hydroxy acids glycolic, lactic, malic, citric and tartaric, and the polyat. alcs. 1,2-propylene glycol, glycerol, mannitol and glucose. In all cases a relative increase in the H-ion concn. over the additive calcd. value has been observed. With H_2BO_3 , $CO_2H[CH(OH)]_2CO_2H$ produced a much greater increase than any hydroxy acid with a single OH group, while with H_2MoO_4 this acid gave the smallest increase. With the alcs. similar results have been found. With H_2MoO_4 glycerol produced the

greatest effect, while the increase due to mannitol was less than that with propylene glycol. With H_2BO_3 the action was most marked with mannitol and dextrose. No relations have yet been derived between the no. of OH groups and the acidity of the complex.

H. JERMAIN CARRINGTON

Studies on solubility. IV. Principle of the specific interaction of ions. J. N. BRUNSTED. *J. Am. Chem. Soc.* 44, 877-98(1922); cf. *C. A.* 16, 870.—The activity coeff. of an ion may be detd. by 2 factors: one due to the salting-out effect of the solvent salt soln. and the other to elec. interaction between the ion and the oppositely charged ions of the solvent. The salting-out effect of a salt soln. can be represented as the product of the salting-out effects of the sep. ions. Derivations are given of relations regarding soly. in salt solns. at const. concn., of a thermodynamic relation between activity coeffs. and osmotic coeffs. in solns. of const. total concn., and of one between soly. and f. p. The foregoing conclusions and relation are verified experimentally.

H. JERMAIN CARRINGTON

The phenomenon of partition. NICOLAS DE KOLOSOVSKY. *Bull. soc. chim. Belg.* 28, 257-64(1919).—A study of the partition of H_2O_2 between H_2O and Et_2O . As the total concn., P , increases, the coeff. of partition, C , between these 2 solvents at 18° diminishes, its value being given by $C = 14.77 - 0.397P + 0.00432P^2$. If m and n represent the degrees of association of H_2O_2 in the H_2O and Et_2O , resp., under these conditions, then it is calcd. that the ratio $n/m = 1.3$, a value which is very close to that previously found for AcOH in the same solvents (*C. A.* 6, 181). J. C. S.*

The nature of secondary valence. V. Partition coefficients in systems containing water as one component with special reference to absolute values of series constants. H. W. SUMRIN. *J. Phys. Chem.* 26, 256-71(1922); cf. *C. A.* 16, 1172, 1521.—Eight systems with H_2O as one component have series consts. for various solutes which are related by simple proportion; in 12 systems using diethylamine the systems are related by simple proportion; amines differ from acids by a const. amt.; the solvent powers of different mol. species differ in intensity by discreet and simply related amts. VI. Summary and discussion. *Ibid* 349-57.—To study the forces involved in liquid solns. the distribution of various org. solutes between immiscible solvents was detd. in 1200 cases for 21 systems of immiscible liquids. To correct for dissociation, association, mutual soly., etc., an empirical interpolation of the partition coeff. when the concn. in 1 solvent has a fixed arbitrary value was made. Simple relations were then apparent. Thus $\log 100P = (V_p/60)^a + a$, where P is the coeff., V_p the mol. vol. at the b. p., and a the series const. with only a limited no. of values required to cover the behavior of all substances. Soly. is thus a function of the mol. vol. of the solute. The stepwise phenomena of the values of a are attributable to discreet or abrupt variations in the intensity of internal forces associated with various mol. species. Substances in a homogeneous liquid phase behave towards the environment as though every mol. homogeneously filled a space which is symmetrical in 3 dimensions. The stepwise behavior is independent of the kind of atoms or mols., but common to all species and inherent in at. structures such as the quantum of energy. But the discreet differences in equal states is independent of time and hence attributable to some property inherent in the fundamental charges themselves.

G. L. CLARK

The mass action relation between the mutarotation constant of dextrose and acid concentration. H. MURSCHHAUSER. *Biochem. Z.* 128, 245-50(1922).—A mathematical expression for the calcn. of the mutarotation const. in a given HCl concn. and the detn. of the HCl concn. of a soln. from the mutarotation const. F. S. HAMMETT

Theory of induced reactions. C. WINTHER. *Z. physik. Chem.* 100, 566-71(1922).—The characteristics of the following induced reactions are discussed: (1) the oxidation in the dark of FeC_2O_4 in the presence of HgC_2O_4 in which the mercurous salt and

CO_2 are formed; (2) the decompn. in the dark of HgC_2O_4 in the presence of MnO_2 to $\text{Hg}_2\text{C}_2\text{O}_4$ and CO_2 ; (3) the photochem. catalytic action of certain preps. of ZnO in different processes. As an explanation of these induced reactions it is suggested that the free energy of the reaction is given out primarily as short-wave radiation. At somewhat high concns. of the reacting substances this radiation is immediately absorbed in the surroundings of the mol. from which it is emitted, this giving rise to the possibility of the radiation being partially taken up by other substances present. This would give rise to ordinary chem. induction with small induction factors. If the reacting substances are very dil., almost the total secondary radiation is absorbed by the other substances present and there results "catalysis with consumption of the catalyst," whereby the induction factors become very large.

H. JERMAIN CRRINGTON

The slow hydrolysis of salts. A. TIAN. *J. chim. phys.* 19, 190-216(1921).—For hydrolytic equilibria which establish themselves slowly one of the products is insol. The hydrolysis under these circumstances is in equil. with two opposing reactions, (a) the ionic reverse of hydrolysis, and (b) a reaction between the solid phase of the insol. product and the soln. of the sol. product. This latter action is termed "supplementary retrogradation" as distinguished from "normal retrogradation" for reaction (a). The velocity of reaction (b) will be detd. by the surface of contact of the solid phase, which at first will be very great while it is finely dispersed, but as the particles grow will become smaller and permit hydrolysis to proceed. The velocity of obtaining hydrolytic equil., then, is detd. by the velocity of the colloidal growth of the insol. product. The following lines of exptl. evidence for the above theory were given. (1) When the growth of the colloidal phase was inhibited (as by a protective colloid) the progress of the slow hydrolysis was arrested. (2) As this slow hydrolysis proceeds, more salt is decomposed and chemically equiv. amts. of acid and base are liberated. (3) Addition of excess colloidal phase will repress the slow hydrolysis. The work was done mostly on FeCl_3 and Na oleate. A chemical theory of the *peptization* of colloidal acids and bases is suggested.

A. E. STEARN

Chemical reactions and radil of curvature. R. LUCE. *Compt. rend.* 172, 1287-8(1921); cf. Reboul and Luce, *C. A.* 15, 2375.—Further expts. are quoted in support of the view that the chem. action of a liquid on a solid depends on the shape of the latter, being greatest at those points where the mean curvature is greatest. Thus the influence of curvature is the same in liquids and in gases.

J. C. S.

Rhythmic deposition of precipitated vapors. E. KARRER. *J. Am. Chem. Soc.* 44, 951-4(1922).—When vials of aq. HCl and NH_4OH are placed in a closed vessel, during the diffusion of the vapors the resulting ppt. is deposited rhythmically on the inner walls of the vial contg. the HCl . The distance between the successive rings formed is seldom const., but increases or decreases gradually from the lowest upwards.

H. J. C.

Reaction between incandescent tungsten and naphthalene at low pressures. M. R. ANDREWS and S. DUSHMAN. *J. Frank. Inst.* 192, 545-6(1921); *Science Abstracts* 25A, 83.— C_{10}H_8 is decomposed by incandescent W above 1500°K ., but the rate of diffusion of the C into the W only becomes more rapid than the decompn. of the C_{10}H_8 at the low pressures used of 0.1 to 3.0 bar, above 2300° . By analyzing the filaments and by measuring the H evolved the authors det. the C content. The elec. conductance of the W at room temp. decreases to 7% of its original value as the C absorbed rises to 3.16%, corresponding to W_2C . On further carbonization the conductance increases to 40% of its original value at 6.1% of C, corresponding to WC. The difference between the resistivity of the carbonized filament and that of pure W seems to be const. at all temps. up to 2400°K . It is said that both the carbides decompose near 2700°K ., and that W_2C m. 3150° and WC m. 3050°K .

H. G.

Reactions at metal boundary surfaces. O. RUFF. *Z. physik. Chem.* 100, 419-24

(1922).—Ca which is alloyed with more positive metals or with Ca_3N_2 takes up N more readily than pure Ca. From this it is assumed that the heteropolar nature of a metallic boundary surface promotes the union of a homopolar gas. It is assumed that the latter receives "influence charges," owing to the surface valences of the metal, which det. its position and behavior with respect to the surface. H. JERMAIN CREIGHTON

The mechanism of the dehydration of crystalline aluminium hydroxide and of the adsorption of water by the resulting alumina. L. H. MILLIGAN. *J. Phys. Chem.* 26, 247-65(1922).—Cryst. $\text{Al}(\text{OH})_3$ prepd. by the Bayer process does not lose wt. below 145° at atm. pressure. Above this temp. decompn. sets in with loss of water until at 200° the trihydrate is completely decomposed. The porous Al_2O_3 still retains 8% water which is given up slowly as the temp. is increased, indicating that it is held by adsorption. Intermediate hydrates between $\text{Al}(\text{OH})_3$ and Al_2O_3 do not exist. On rehydrating the ignited Al_2O_3 in moist air at room temp. it takes up water, the amt. taken up being greater the lower the temp. of ignition. The curves obtained on drying these samples show that the cryst. $\text{Al}(\text{OH})_3$ is not formed again, but the water taken up is adsorbed. X-ray examn. (by Hull's method) of the materials shows that the cryst. $\text{Al}(\text{OH})_3$ is identical with the mineral gibbsite, and that the ignited Al_2O_3 has an entirely diff. structure. The X-ray pattern of the Al_2O_3 does not change as it adsorbs water. F. L. BROWNE

Some new lecture table experiments in chemistry. H. F. DAVISON. *Gen. Sci. Quarterly* 6, 298-301(1922).—Diagrams are given of devices used to illustrate gas diffusion, dust explosion and fire extinction. The ignition point of CS_2 is shown by heating a thermometer to the required temp. and touching it to the CS_2 in a shallow dish. The interaction of Al and I is shown by mixing them in dry powd. form and dropping water on the mixt. G. W. STRATTON

Comparison of the union of carbon atoms in graphite and in aromatic hydrocarbons (with regard to the work of Fajans and von Steiger.). J. P. WIBAUT. *Rec. trav. chim.* 41, 97-102(1922).—Fajans (*C. A.* 14, 1623, 3086) calcd. the energy of atomic union of aliphatic hydrocarbons from their heats of combustion. Von Steiger (*C. A.* 14, 3232) extended it to aromatic hydrocarbons. After reviewing F.'s work W. states that v. S. started out with the "hypothesis *a priori*" that as in graphite C in hydrocarbons has 3 valences situated 120° apart. The 4th valence is so weak that it may be neglected energetically. V. S.'s proof is given. W. on the contrary assumes that the C is quadrivalent and that each C atom is bound to 3 others and to 1 H atom or to 4 C atoms. By using a series of equations similar to those of F. and v. S. he confirms this hypothesis in the same way that v. S. confirmed his, from which he concludes that the calcs. of v. S. have no phys. significance and do not confirm the hypothesis that in aromatic rings the C atoms are tervalent. From the chem. point of view such a hypothesis is unsatisfactory since C_6H_6 combines with 6 atoms of H at room temp. in the presence of a catalyst and is, therefore, in this respect similar to the aliphatic hydrocarbons. Therefore, v. S. has not proved that the C-C union in aromatic rings is energetically equiv. to that in graphite. In another paper W. will discuss the unions C-C and C=C comparatively. E. J. WITZEMANN

Reactions in gas generators and blast furnaces. H. v. JÜPTNER. *Z. physik. Chem.* 100, 231-7(1922).—A discussion of the equilibria. The partial pressures of the gases in gas generators are calcd. for different conditions. H. J. CREIGHTON

Applicability of chemical energy and the conception of affinity. R. PLANK. *Z. physik. Chem.* 100, 372-92(1922).—A mathematical paper. H. J. CREIGHTON

A revision of the entropies of the elements. G. N. LEWIS, G. E. GIBSON and W. M. LATIMER. *J. Am. Chem. Soc.* 44, 1008-17(1922).—From the principles of Sackur and of ultimate rational units, entropies of the monatomic gases are obtained

which agree with exptl. values within the limits of exptl. error. Entropies for a large no. of solids calcd. in a similar manner on the assumption that the at. wt. is the sole factor in detg. entropy, agree very closely with the exptl. values. A review is given of recent detns. of the entropies of the elements, and a table of the at. entropies so far calcd. is included. The evidence presented removes all doubt regarding the exptl. verification of the third law of thermodynamics.

E. N. BUNTING

The free energy of gas molecules with any distribution of velocity. MAX PLANCK. *Sitzb. preuss. Akad. Wiss.* 1922, No. VIII, 63-70.—From free energy considerations it is demonstrated that gas mols. which differ only in translational velocity can be considered as different kinds of mols. in the usual sense of the Gibbs addition theorem. An explanation of the so-called *Gibbs paradox* is given. A partition which is permeable to mols. of high velocity but impermeable to slower ones is consistent with the second law of thermodynamics.

E. N. BUNTING

Certain relations between critical temperature, boiling point and freezing point. MAURICE PRUD'HOMME. *J. chim. phys.* 19, 188-9(1921).—Semipolemic in answer to a note by van Laar (*C. A.* 16, 191). (Cf. also *C. A.* 15, 783-784.)

A. E. S.

Freezing points of organic substances. III. JEAN TIMMERMANS. *Bull. soc. chim. Belg.* 28, 392-402(1919); cf. *C. A.* 6, 174; 9, 9.—Org. compds. obey a law of convergence in that the m. ps. of the higher terms of all the homologous series tend towards a common limit of 117° . There are, however, certain series which do not obey this law, but they are considered as constituted of substances with particular structures, such as the amino acids, substances contg. 2 amide groups or an analogous group. It results from the above law that, for the higher members of a series, phys. consts. such as the m. p. are not a criterion for differentiating one homolog from another. IV. New experimental determinations. *Ibid.* 30, 62-71(1921).—The f. ps. of further 94 specially purified org. liquids were detd. at temps. ranging from -187.8° , the f. p. of propane, upwards. The results are expressed in tabular form in the original paper. V. The odd and even alternation and the lowest melting point in a homologous series. *Ibid.* 89-97.—A theoretical paper in which T. discusses the relationship between m. ps. and spatial structure of the mol. The linear structure of open C chains as postulated by Hinrichs (*Compt. rend.* 112, 998, 1127-30; 113, 313-5(1921)) is in accord with the exptl. facts as to the m. ps. of members of homologous series. The alternation of m. ps. between the odd and even members of a series is a general phenomenon, the odd members melting lower than the even members in series where the mol. is symmetrical in relation to the center of the chain, e. g., the oxalic acid series, paraffins; fatty acids, but this alternation may be inverted in series not having this symmetry, namely, ketonic acids, alkyl chlorides, etc. This alternation may be completely masked by the mass of a characteristic group being so great as to cover the influence of the C chain. The existence of a min. m. p. for one of the members of a series other than the first is very general, and is in accord with Hinrich's hypothesis. This min. may be situated anywhere from C_1 to C_{10} , according to the series, but in the majority of cases it is reached at the C_4 member.

J. C. S.

Micro-molecular weight determination with melting-point apparatus. K. RAST. *Ber.* 55B, 1051-4(1922).—Camphor is used as the solvent. On account of its large f.-p. depression (40° for a concn. of 1 mol. per kg. of solvent), a Beckmann thermometer may be dispensed with even with relatively dil. solns. Further, camphor is an excellent solvent for many substances. A few mg. of the substance is melted in a small specimen tube with a known wt. of about 10-20 times as much camphor; the tube is closed with a stopper during melting. The camphor which sublimes on the upper part of the tube is removed and its wt. deducted from that of the camphor used. A portion of the melt is removed and packed closely into the bottom of an ordinary m.p. tube, and its

m. p. detd. in the ordinary way. The bottom of this tube should be blown out into a small bulb. The temp. at which the last crystals on the bottom of the small bulb disappear is taken as the m. p. Excellent results have been obtained with this method, as is shown by the following example: naphthalene, 8.7 mg. in 88.2 mg. $C_{10}H_{10}O$ (*N* soln.); calcd. f. p. depression = 39.7° , observed f. p. depression = 40° ; calcd. mol. wt. = 128, observed mol. wt. = 127.

H. JERMAIN CREIGHTON

The vapor pressure of sulfur dioxide and ammonia. F. W. BERGSTROM. *J. Phys. Chem.* 26, 358-76(1922).—The vapor pressure of SO_2 was detd. between -5.5° and -90.1° , and of NH_3 between -30° and -84.4° , i. e., from slightly above normal h. p. to solid. The normal b. p. of SO_2 was found to be -10.05° ; no triple point was observed for it; and its vapor-pressure curve (in mm. Hg) is represented with an accuracy of about ± 1 mm. by the equation $\log_{10} P = (-1577.3/T) + (1.75 \log T) - (0.006411 T) + 0.3288$. The normal b. p. of NH_3 is -33.4° ; a well defined triple point was found at -77.9° and 45.5 mm. The data for SO_2 and NH_3 give straight lines when tested by the Ramsay-Young relation, with H_2O or $MeOH$ as the standard substance. The vapor-pressure measurements of Brill on NH_3 (*C. A.* 1, 268), and of Burrell on SO_2 and NH_3 (*C. A.* 11, 311) do not satisfy the Ramsay-Young relation. Burrell's vapor-pressure measurements of NH_3 and SO_2 are "in all probability erroneous." Pressures were measured with a modified Germann-type manometer, and the temp. with a Pt-resistance thermometer. A novel low-temp., Hg-toluene thermoregulator is described.

R. H. LOMBARD

The relative lowering of vapor pressure of aqueous solutions. M. C. BOSWELL and R. C. CANTELO. *Can. Chem. Met.* 6, 109-11(1922).—The bubbling method gives errors which vary with the app.; so a simplified method was worked out to sat. air with the vapor of the liquid by passage over its surface. About 1 g. was evapd. in 6 hrs. Vapor pressure lowerings are given for solns. of KCl, KI, $CuCl_2$, H_2SO_4 , NaOH, $AgNO_3$, sucrose, pyrogallol and resorcinol.

F. O. A.

Le Chatelier's "new" geometric representation. E. JÄNECKE. *Chem.-Zig.* 46, 361(1922).—In a paper on the double decompn. of salts and their geometric representation (*C. A.* 15, 1445) Le C. claims a better method of showing the relationships of pairs of salts than that of van't Hoff. J. disputes the claim, and refers to his own publications, beginning in 1906, and to the many applications of his method by both German and foreign investigators.

W. C. E.

Some mixtures having a minimum boiling point. FAILLERBIN. *Bull. soc. chim.* 29, 272-3(1921).—Preliminary study indicates that there exist not only binary mixts. of esters with water and in some cases with alcs., possessing minimum b. ps., but also ternary mixts. consisting of different esters, alcs., and water, which are similarly characterized. The b. ps. and compns. of several mixts. are given.

J. T. R. ANDREWS

The system furfural-water. II. G. H. MAINS. *Chem. Met. Eng.* 26, 841-3 (1922); cf. *C. A.* 16, 1899.—By modifying Rayleigh's mathematical treatment of soln.-distillate relations (cf. *Phil. Mag.* [6] 4, 527(1902)) the distillate necessary to obtain any given proportion of furfural (*F*) in the original soln. can be calcd. If w_0 = initial wt. of soln. in the distn. app., w = wt. remaining at any time and y = wt. of *F* in soln., the initial compn. of the soln. or abscissa ϵ of the curve is y/w and the compn. of *w* is ϵ_0 . Then from the relation between the compn. of soln. and distillate $\eta = f(\epsilon)$

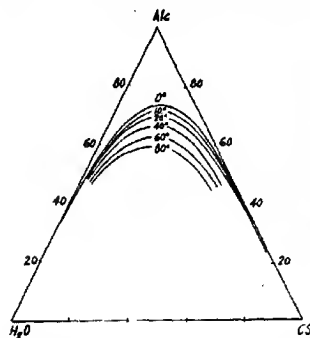
can be derived the relation $\log (w/w_0) = \int_{\epsilon_0}^{\epsilon} (d\epsilon/f(\epsilon) - d\epsilon)$. When ϵ is below 3% *F*,

the curve is a straight line and the relation is simplified to $\epsilon/\epsilon_0 = (w/w_0)^{k-1}$. Calcs. from the lower section of the curve show that k is approx. const. at 7.5 for solns. less than 0.5% *F*, and then gradually diminishes as *F* increases until at 3% *F* it is 5.7. Be-

yond this the curve deviates too far from a straight line to use the last equation. Calcs. are given to show the proportion of dil. F of known concn. to distil in order to recover any fraction of the F. For a yield of 5 lbs. of F per day, an ordinary Cu column is satisfactory. Small amts. of F may be concd. by several distns., but in large quantities an efficient fractionating column is essential. Continuous distn. yielding 50 lbs. of F per day from a 2% soln. is now in operation at the Color Lab., U. S. Bureau of Chemistry.

C. C. DAVIS

The system water-alcohol-carbon disulfide. The miscibility of the three constituents in various proportions and the practical applications which may be derived from it. N. SCHOORL AND MISS A. REGENBOGEN. *Rec. trav. chim.* 41, 125-34(1922);



cf. *C. A.* 16, 1353.—The *Pharmacopée neerlandaise* states that 2 cc. of abs. EtOH contg. not over 1% H₂O should give a clear mixt. with 5 cc. CS₂ at 15°. The region of unmixing of this ternary system was investigated in order to det. whether or not this is true. The boundaries of this region were detd. by detg. the isotherms at 0, 10, 15, 20, 40, 60 and 80° as well as the curves of upmixing and the crit. temps. of mixts. of CS₂ and abs. EtOH or of EtOH-H₂O mixts. of known concn. The isotherms are given in the figure. For the tabulated data and other curves see the original. The EtOH test with CS₂ in the proportion of 2 : 5 shows the transition from a clear to a turbid soln. at 15° with 97.8% EtOH (by vol.). In melting ice the turbidity just fails to appear with 98.85% (by vol.) EtOH.

E. J. WITZEMANN

Determination of the thermal and electric conductivities of metals. G. PFLIEDERER. *Arch. Kaiser Wilhelm Inst. Kohlenforschung* 4, 429-39(1920); *Science Abstracts* 24A, 768.—The method used in the expts. (cf. *C. A.* 15, 2770) is a modification of the method of Lees. The rod of the substance under test is placed vertically between two blocks of Cu, the lower block cooled by water, the upper heated by nichrome wire. Good contact between the ends of the rod and the block is obtained by amalgamation; the space between the parts and the casing is packed with compressed cotton wool. The elec. energy is measured which is required to keep the temp. const., and the expt. is repeated after removal of the rod; thus the heat flow through the rod and λ are detd. To find k the intensity and p. d. of an elec. current passing through the rod are measured.

H. G. v.

Paschen's law generalized for the case of polarizable dielectrics. C. E. GUYE *Arch. sci. phys. nat.* 4, 5-9(1922).—To extend the expression for the explosive potential from the case of a perfect gas to that of a polarizable medium it is necessary only to multiply by a const. which is dependent on the gas used and the no. of mols. per unit vol. Exptl. verification should be sought by measuring the potential for different distances between the electrodes. The most convenient form is apparently $AV = F(Ma)$, where A is the above mentioned const., V is the explosive potential, M is the no. of mols. per unit vol. and a is the distance between the electrodes.

E. D. WILLIAMSON

Explosive potentials in carbon dioxide under pressure. C. E. GUYE AND P. MÉRCIER. *Arch. sci. phys. nat.* 4, 27-37(1922).—Expts. were carried out with a pressure range of 50 atms. and with the electrodes at various distances from 0.5 mm. to 5 mm.

Three different means of ionization were used, namely, a Nernst lamp, a Ra cell, and an X-ray tube. The results can be summarized as follows: CO_2 acts in a similar fashion to N_2 . Paschen's law (cf. preceding abstr.) is obeyed with fair approximation except in the case of the shortest distance. The accuracy is not sufficient for a decision on the point as to whether the pressure or the number of mols. per cc. should be used in the statement of the law.

E. D. WILLIAMSON

The dielectric anomalies of silica glass. A. JAQUEROD AND H. MUGELI. *Arch. sci. phys. nat.* 4, 10-26 (1922).—An introductory sketch of theories of dielectrics. Exptl. results are promised later.

E. D. WILLIAMSON

The dielectric constants of liquids and their relation to temperature. H. ISNARDI. *Z. Physik* 9, 153-79 (1922).—The dielec. consts. of a number of liquids were measured between -186° and 200° . Debye's theory (*C. A.* 6, 1087), that the function $(\epsilon - 1)/(\epsilon + 2) \times (T/D) = kT$, is not sufficient to account for the results. These tend to support a modification of this theory by Gans (*C. A.* 15, 2581), taking into account the influence of mol. fields. Ether, CHCl_3 and toluene have mols. with permanent moments so that the influence of orientation on the magnitude of the dielec. const. is very small. CCl_4 , C_6H_6 , *m*-xylene and CS_2 have no permanent moments but behave like MeOH and EtOH . For the latter group $(\epsilon - 1/\epsilon + 2) \times (1/D)$ is a linear function of the temp., while for the other group it passes through a max. A. E. STERN

Measurements of the deviations from Ohm's law in metals at high current densities. P. W. BRIDGMAN. *Proc. Nat. Acad. Sci.* 7, 299-303; cf. *C. A.* 15, 1447; 16, 376.—By making simultaneous resistance measurements by means of two superimposed currents, one a heavy d. c. and the other a very small a. c., the difficulties met by other investigators were successfully overcome. The resistance to the heavy current of over 10^4 amp. per cm^2 is always the greater, the difference increasing with the current density and being greater for thicker material. Expts. were carried on with thin films of Au and Ag. Details are not given in this paper but are promised in a subsequent publication.

E. D. WILLIAMSON

Variation of electrical resistance of mercury under low pressures. W. JÄGER AND H. v. STEINWEHR. *Z. Physik* 9, 201-2 (1922).—In connection with the use of Hg as a resistance standard the pressure coeff. between zero and two atm. was detd. as 4×10^{-3} . Extrapolation in Bridgman's formula obtained at high pressures gave 3.8×10^{-3} .

A. E. STERN

The conduction of electricity in molybdenite. O. U. VON WILLER. *J. Proc. Roy. Soc. N. S. Wales* 55, 220-33 (1921).—The resistivity of molybdenite was measured by passing a current from Cu to molybdenite to Cu. Bars of molybdenite 2-4 cm. in length to which were connected at equal intervals four strips of Cu were used for the expts. The magnitude of the current was varied and measurements were made at various temps. ranging up to 200° . The contact resistance decreases greatly on rise of temp. but no const. relationship was noted. The resistance of molybdenite decreased with temp. On cooling the resistance did not return to the original value. The results of expts. are expressed by curves. An e. m. f. of 560 micro-v. was found by passing a current from Cu to molybdenite to Cu, and the temp. of the junctions differed by 1° . The current flowed from Cu to molybdenite at the hot junction. The thermoelectric height compares with those of Si and Se.

D. T. EWING

Contracted condition of electrolytic metallic deposits. (Miss) G. ALIVHATTI. *Atti. accad. Lincei* 29, I, 453-7 (1920).—The object of the investigations was to ascertain if the marked contraction usually exhibited by metals deposited electrolytically is due, to any appreciable extent, to thermal effects. The results obtained when solns. of Ni salts are electrolyzed under different conditions show that this is not the case and that the contraction is due to a surface tension of the metallic layer dependent on the manner

in which the metal is deposited. Confirmation is obtained of Stoney's observation (C. A. 3, 1743) that the extent of the contraction diminishes as the temp. of the electrolytic bath rises, and it is found further that, when the deposition takes place from a soln. contg. strychnine, the metal is obtained first in an expanded state, the expansion subsequently undergoing conversion into a contraction of less degree than that observed with solns. of pure Ni salts. Increasing alky. of the soln. electrolyzed results in increasing contraction of the deposit, while the contraction diminishes if the solution is made acid and changes to expansion when 2% by vol. of H_2SO_4 is present; in the latter case the expansion attains a const. value after the electrolysis has been continued for a certain time. Thus, the deposition of H simultaneously with the Ni appears to diminish the contraction of the deposit in proportion to the amt. of H sepg. H. G.

Use of phthalate solutions for hydrogen electrode standards. E. T. OAKES AND H. M. SALISBURY. *J. Am. Chem. Soc.* 44, 948-51 (1922).—Solns. of $C_6H_4(CO_2)_2HK$ give a progressive decrease in H-ion concn. when in continued contact with the H electrode, the decrease being due probably to a reduction of the phthalate. H. J. C.

Behavior of photohalides in the electric current (direct). C. TUBANDT AND G. ESCHENHAGEN. *Z. physik. Chem.* 100, 499-501 (1922).—Photohalides formed synthetically as well as those produced by the action of light are purely electrolytic conductors. The presence of colloidal metals, bound either by sorption or mixed mechanically in large quantities, does not enter into the character of the cond. of these substances. Metallic Ag can be sepd. electrolytically from both strongly illuminated dry AgCl and AgBr and from synthetic photochloride and bromide, but not from the iodide. In synthetic photohalides and in Ag halides that have been decomposed by light, all of the colloidal Ag is indifferent to and plays no part in the passage of a d. c. The Ag ions which alone share in the transport of the current, as in pure Ag halides, migrate uninfluenced between the particles of metallic Ag. A displacement of these particles has not been observed even after a current has been passed for a long time. H. J. C.

A neglected electromagnetic force. CARL HERING. *Chem. Met. Eng.* 26, 513 (1922).—If a thin triangular piece of Cu, well amalgamated, is floated on a trough of Hg and a very large direct current is passed through the bath, the piece will move across the trough blunt end foremost. This phenomenon has been described by E. F. Northrup (C. A. 7, 1140), who explained it as the result of the "pinch effect," or radial contraction of the conductor being greater at the smaller than at the larger end of the foil. This may be more logically explained by supposing that the magnetic flux encircling the main path of the current near the small end is more dense than that around the main path at the large end; it is as though those lines of force act like compressed helical springs under unequal compression. The tendency of the Hg conductor to stretch or lengthen itself is therefore greater at one end than at the other, and hence there will be a short movement until a balance is reached. This being verified by expt. it follows that an a. c., which will give a continuous rapid succession of such impulses, should produce continuous motion. This was found to be the case, and is confirmation of N.'s observation that reversal of the direct current does not reverse the motion of the piece of Cu. This longitudinal electromagnetic force has been neglected by physicists, presumably because it happens to be zero in what appears to have been the fundamental case on which our present mathematical treatment of such forces is based. Such new and peculiar forces may perhaps be of use in problems connected with elec. furnaces.

J. T. R. ANDREWS

Molecular refraction of some molten salts. G. MEYER AND A. HECK. *Z. physik. Chem.* 100, 316-33 (1922); cf. C. A. 16, 1533.—The indices of refraction of molten $NaNO_3$, KNO_3 , $NaOH$ and KOH have been measured at a no. of temps. between 320 and 440° by a modification of the autocollimator-method. The indices of refraction of

the salts are dependent linearly on the temp. New detns. have been made of the d of molten NaOH and KOH: NaOH, $d_{20} = 1.89$, $d_{25} = 1.84$; KOH, $d_{20} = 1.87$, $d_{25} = 1.81$. Values for the mol. refraction of the salts calcd. by the Lorentz-Lorenz formula are in close agreement with the observed values. The mol. refractivities have been used to det. the degree of dissoc. of the molten salts.

H. JERMAIN CREIGHTON

Electromotive force of cells at low temperatures. G. W. VINAL and F. W. ALTRUP. *Bur. Standards, Sci. Papers* No. 434, 627-34(1922).—See C. A. 16, 1708. E. J. C.

Rectilinear diameter of hydrogen. E. MATHIAS, C. A. CROMMELIN and H. K. ONNES. *Proc. Acad. Sci. Amsterdam* 23, 1175-84(1922).—See C. A. 15, 1644.

E. J. C.

A comparative study of methods used for the measurement of color. T. MARTIN LOWRY and L. P. MCHATTON. *J. Oil Colour Chemists' Assoc.* 4, 189-204(1921).

F. A. WERTZ

Color measurement. HEINRICH TRILLICH. *Farben-Ztg.* 27, 1721-3, 1794-8, 1874-6, 2017-22(1922).—A criticism of Ostwald's system of color designation (C. A. 14, 492) and a suggested modification of his color circle.

F. A. WERTZ

Theory and practise in color measuring and recording. A. E. BAWTREE. *J. Oil Colour Chemists' Assoc.* 4, 165-88(1921).—A discussion of the system of designating colors as described by Lawrence (C. A. 13, 1643) and their measurement according to this system with the Bawtree colorimeter (C. A. 15, 2).

F. A. WERTZ

Color circles. W. H. THOMAS. *Textile Colorist* 44, 241-2(1922).—Describes a circle system of shading which shows the shade produced by mixing any 2 colors, and its comparative brightness.

CHAS. E. MULLIN

Cell for the observation of colloidal solutions for use with substage ultra-condensers (FAIRBROTHER) 1. Apparatus for the measurement of the Thomson effect in wires (NETTLETON) 1. Length of side of elementary lattice of Mo [Coagulation of colloidal Au] (STOLL) 3. Spectroscopic method for the detection of the formation of complex salts in dilute solutions (SHIBATA, *et al.*) 3. Mechanism of catalytic hydrogenation (SKIYA) 10. Molecular coefficients of refraction (AUWERS, KOLLIGS) 10. Complex tautomerism (LEY, GRAU) 10.

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- Women in Chemistry. New York: Bureau of Vocational Information, 2 W. 43d St. \$1.10 bound \$1.60.

3--SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

The discontinuity and unity of matter. ADOLPHE LEPAGE. *Bull. soc. chim.* 31, 1-94(1922).—An excellent detailed review of the evidence touching the existence and structure of atoms.

NORRIS F. HALL

Isotopes. G. M. J. MACKAY. *J. Ind. Eng. Chem.* 14, 447-8(1922).—Excerpts from a lecture by Aston on his own work on isotopes.

G. L. CLARK

Isotopy. ERICH BAISCH. *Z. angew. Chem.* 34, 525-6(1921).—A review.

NORRIS F. HALL

Isotopy of the elements. R. BRUNETTI. *Nuovo cimento* 22, 5-42(July-Aug., 1921); *Science Abstracts* 25A, 82.—B. discusses the question of isotopy in its relation to the at. theory and to the periodic system of the elements. Of 24 elements belonging to the series of inert, non-radioactive elements which have been examd. as to their possible isotopy, 12 are undoubtedly not simple in constitution. Some of them exhibit, on preliminary analysis, only two components, whereas with some of the heavier 5 or 6 components are revealed. It would thus appear that the isotopic complexity of an element increases with its wt. Excepting in the case of H, all of the at. weights of the isotopes of the 24 elements are whole numbers with an exactitude in most cases of 1:1000. A bibliography of this subject is appended.

H. G.

Isotopes and atomic weights. F. W. ASTON. *Proc. Roy. Inst. Gr. Britain* 1921, (Sep.) 11 pp.; *Rev. sci.* 60, 285-91(1922).—See C. A. 15, 1852.

N. F. H.

Atomic radii. I. MAURICE L. HUGGINS. *Phys. Rev.* 19, 346-53(1922).—With the aid of the Lewis theory the at. radius is defined as the distance from the nucleus to the valence electrons (usually an electron pair) in the valence shell. This idea is applied to several crystals. Bragg had called the distance between adjacent nuclei the sum of the radii but this did not allow for the overlapping which often occurs between spheres. A number of possible reasons are given for variation in radii of atoms; not all valence electrons may act as bonds, the valence electron pair may be forced out of its normal position when in the crystal lattice, different kinds of atoms may have different attractions for the pair, different crystal lattices for the same compd., different number of pairs shared by an atom in different compds., valence electrons not on true center line, some atoms have variable valence, and sometimes more than 2 electrons are required for a bond.

F. O. A.

Atomic structure. M. I. HUGGINS. *Science* 55, 459-60(1922).—A modification of the Lewis atom is proposed in which the 5th, 6th, 7th and 8th electrons in the 2nd and 3rd shells pair off with the first 4, the distance between 2 electrons constituting a pair being much less than that between different pairs. The shells are therefore tetrahedra of pairs instead of cubes of single electrons. After the 2nd shell it is postulated that electrons lie opposite the centers of the faces of an imaginary polyhedron formed by the electron groups in underlying shells. In heavier atoms the same forces which result in pairs may form electron triplets. Examples of applications are given.

G. L. CLARK

Laue interference and atomic structure. P. DEBYE. *Naturwissenschaften* 10, 384-91(1922).—An extensive chronological bibliography is appended to the résumé.

C. C. DAVIS

The law of mutual repulsion and the diameter of nitrogen molecules. R. BECKER. *Z. physik* 9, 118-22(1922); cf. *C. A.* 15, 2575.—Amagat's data on the 0° and 15° isotherms of N₂ are studied in the light of B.'s equation of state. A satisfactory agreement is obtained by the assumption of a repulsive force between mols. decreasing as the 18th power of their distance apart. This power law furnishes a new value for the mol. diam. of N₂ (3.18×10^{-8} cm.).

NORRIS F. HALL

The structure of the atomic nucleus. O. CHWOLSON. *Z. physik* 7, 268-84(1921).—An attempt to indicate the general direction in which it is perhaps possible to seek the solution of the problem of the structure of the nucleus. After pointing out that a spherical elec. charge (as an electron) does not have an additive electro-magnetic mass in the sense that its mass is the sum of the masses of any no. of smaller elementary spheres into which it may be imagined as divided, C. finds that a thin disk of electricity does have this additive property. Const. vol. d. of charge is here assumed. The mass of such a disk is found to depend on the direction of acceleration, in relation to its axis. In the 2nd part of the paper a preliminary attempt is made to apply the above ideas to actual atoms. The He nucleus is taken to be the elementary positive disk and is called a *petalon*. An electron is normally spherical, but when caught between 2 petalons, it assumes a disk form and is then called a piezoelectron. A piezoelectron has the same diam. as a petalon and a mass $\frac{1}{2}$ as great. All actual nuclei are disk-shaped, being built up of the still thinner petalon and piezoelectron disks. The results are in general accord with exptl. facts and in addn. do not lead to any serious conflict with the Bohr theory equations. The H nucleus is explained with the aid of an additional assumption as a combination of one petalon and one piezoelectron.

R. T. BIRGE

Radioactivity and the constitution of atoms. L. MEITNER. *Festschrift Kaiser Wilhelm Ges. Forderung Wiss. Zehnjährigen Jubiläum 1921*, 154-61.—A general review of radioactive changes and their bearing upon the problem of the structure of the at. nucleus, with especial reference to M.'s previous work. There is a brief sketch of the proof that the Act chain is a side branch of the main U chain, beginning at U II, and that protactinium is the parent of Act. It is then assumed that the nucleus is composed of neutralized He atoms (α'), charged He atoms (α), H nuclei, and electrons. The alternative changes occurring at Ra C, Act C, and Th C are assumed due to the alternative possibilities β - β - α' or β - α' - β sequences, where the 2 ejected electrons are those associated in the nucleus with the neutral (α') He atom. For after one electron is ejected, the remaining electron and He nucleus are unstable, and it is a matter of chance which comes out first.

R. T. BIRGE

An attempt to separate the isotopes of chlorine. H. HARTLEY, A. O. PONDOR, E. J. BOWEN AND T. R. MERRYON. *Phil. Mag.* 43, 430-6(1922).—A photochem. method was used in which white light was filtered through a long column of Cl gas and then passed into an equiv. mixt. of Cl and H. The expected action was that the Cl filter

contg. a large excess of Cl_2 - CH_4 mols. would eliminate wave lengths capable of being absorbed by that variety of Cl mols. and leave light especially active toward Cl_2 which would be caused to combine with H in a greater proportion than normally. After partial reaction the uncombined Cl was absorbed by Hg and the gases were passed through H_2O . The HCl was converted to NaCl and the Cl equiv. was detd. It proved to be normal and it is not known whether the failure to effect sepn. is to be attributed to overlapping of the absorption bands of the 2 isotopes or to the large secondary (non-photochem.) action of the free Cl atoms according to Nernst. It is proposed to repeat the chlorination using trichlorohromomethane which is not subject to secondary reaction.

S. C. LOND

Isotopes and spectrography of mass. S. VEIL. *Rev. gén. sci.* 33, 134-40(1922).—A general review of the discovery and history of isotopes as given in the work of Soddy, Rutherford, J. J. Thomson and Aston.

W. F. MEGGERS

Some problems of the mass spectrograph. F. W. ASTON. *Phil. Mag.* 43, 514-28 (1922).—Some points raised by the performance and development of design of the mass-spectrograph are discussed. The linearity of the mass-scale and the resolving power of the existing apparatus are explained. The agreement between theory and expt. is shown to be good. The questions of improvement in position of the plate and second-order focussing are discussed. The latter is shown to be feasible. Lies are suggested on which future improvements are possible.

S. C. L.

Parent of the uranium and actinium series. A. PICCARD AND E. STÄHEL. *Arch. sci. phys. nat.* 3, 541-3(1921); *Science Abstracts* 25A, 51.—Contrary to the general opinion that the Act series is a lateral branch of the U-Ra family, one of the authors has put forward the hypothesis that UY is produced by an independent isotope of U, namely Act U. Assuming an at. wt. of 235 for this substance, then that of Act D should be 207. To elucidate this and other points arising from Piccard's theory the authors have carried out a series of investigations to which reference is made in the present paper. Their observations appear to confirm the hypothesis of two Act uraniums. The Act family commences, therefore, by the following substances: Act UI(239)— α -U V(235)— β -U Z(235)— β -Act UII(235)— α -U Y(231)— β -Pa(231)— α -Act(227). As a mean of 14 observations (varying between 24.20 and 24.80) the authors obtain a value $T = 24.52 \pm 0.05$ days for U X; and as a mean of 12 observations (1.152 to 1.122) $T = 1.138 \pm 0.003$ minute for U X₂. Reference is also made to observations relating to the constancy of radioactivity on the ground, under the ground, and at different altitudes.

H. G.

A new radioactive body. A. PICCARD AND E. STÄHEL. *Physik. Z.* 23, 1(1922).—U X was prepd. from 50 kg. U (as nitrate) by ether-water extn. and pptn. with CeF_4 . While the hard β -radiation showed the regular decay curve for U X, the soft β -radiation decayed with increasing slowness and continually became softer. This indicates the presence of a weakly radiating body which is longer lived than U X. This body is called U V. Its half life is estd. as about 48 days and μ for Al as 2300 cm.^{-1} . U V is believed to be an isotope of U Y and to occur either 2 places above or 2 places below it in the Act series.

NORRIS F. HALL

History of the discovery of the interference of Röntgen rays. W. FRIEDRICH. *Naturwissenschaften* 10, 363-6(1922).

C. C. DAVIS

The wave length of γ -rays. LISE MEITNER. *Naturwissenschaften* 10, 381-4 (1922).—A summary of present knowledge.

C. C. DAVIS

Coloring and luminescence by means of Becquerel rays. S. MEYER AND K. PRZIBRAM. *Z. physik. Chem.* 334-6(1922).—A brief account of the change in the color of violet colored glass, quartz, sapphire, etc., under the action of Becquerel rays. Some of the materials develop thermoluminescence under continued action of the rays.

H. JERMAIN CROFTON

The effect of penetrating radium rays on inorganic colloids and biocolloids. III. A. FRIEDAU AND W. PAULI. *Kolloid Z.* 30, 6-13(1922).—The glutin of bone glue was chosen as a protein differing in compn. and properties from albumin, which had been studied previously. Four cc. of soln. were used, exposed to radiation from 210 mg. Ra Ba sulfate (78.6 mg. Ra). The glass wall of the tube permitted practically none of the soft rays to pass, 25% of the hard β -rays, and 99% of the γ -rays. Viscosity of the soln. was measured periodically, and under the influence of the radiation fell from 1.225 (relative) to 1.054 in 31 days. In the same time a control not subjected to the rays fell only from 1.225 to 1.220. In the presence of 0.1 N NaCl the effect was less marked but there was still a notable difference between the radiated and unirradiated samples. The same phenomena were observed in the presence of dil. HCl. Previous expts. had shown that albumin was coagulated by the rays in a manner analogous to denaturation by heat, and in the above expts. the changes were also similar to those produced by heat. A similar analogy was observed in H-ion measurements of radiated solns. of acid albumin and Na caseinate—"an irreversible liberation of acid valences, or increasing combination of alkali." Effects of radiation on suspensions of *lecithin* and *cholesterol* are very slight, and are not comparable to the changes produced in proteins.

H. W. BANKS, 3RD

Stopping power and atomic number. J. L. GLASSON. *Phil. Mag.* 43, 477-81 (1922).—G. shows that the stopping power (σ) exhibited toward α -rays by the various elements can be formulated: $\sigma = kN^{1/2}$, in which N is the at. no. and k is a const. with the value 0.262, the stopping power for H, so that a very simple relation is shown between stopping power and at. no. which, though empirical and only approximate, may be adopted as a convenient formulation until more is known of the fundamental theory. It is shown that the formula fits the observed values of σ somewhat closer than Bragg's square root of the at. wt. formula.

S. C. LIND

Active modification of hydrogen and nitrogen produced by alpha rays. F. H. NEWMAN. *Phil. Mag.* 43, 455-62(1922).— α -Rays from a plate on which Po had been electrolytically deposited were allowed to act on N at pressures of 3, 96, and 304 mm. in the successive presence of films of Na, K, Na-K, S, P, I, As, Mg, and Hg. In all cases N disappeared as indicated by a fall in pressure. Presence of NH_3 was found by drawing moist air over Na and K and by boiling Mg with KOH soln. Negative tests for nitrides were obtained with S, I, and P. The gas was not reliberated by heating and therefore was not merely occluded and in some cases at least must have been chemically combined. H was allowed to act in the same way on S, P and I. Reduction of pressure took place but the pressure was restored on heating. The H was rendered reactive to Na-K alloy. After passing over S the usual H_2S test was obtained with Pb acetate. By interposing an electrostatic field between the ionization and reaction chambers it was shown that the final action cannot be due to ions. No data as to the quantity of Po used are given.

S. C. LIND

Can the constancy of radiation of tubes or needles of radium be relied upon? T. NOGIER. *Arch. Elec. méd.* 29, 110-12(1921); *Science Abstracts* 24A, 522.—A general discussion as to whether a purchaser of Ra for medical purposes can consider, owing to the extremely long period required for Ra disintegration, the effects during a human lifetime as being const. N. considers this constancy during 6 or 7 years is illusory, in spite of certificates such as are given by the Curie lab. Owing to minute orifices in the lead case the Ra can escape during sterilization. However much hermetical sealing may be obtained in the first instance, any accidental injury to the envelope during operations, etc., leads to loss and also the internal bombardment of the envelope leads to modification of its mol. structure. The accumulation of the He evolved raises the pressure and increases losses via minute orifices, and N. concludes that in practice

the life, and therefore the medical properties, of a tube of Ra cannot be considered as const. H. G.

Remarks on ionization by cumulative action. K. T. COMPTON. *Phil. Mag.* 43, 531-7(1922).—A discussion of ionization, particularly of monatomic gases, at potentials below the ionization potential. Two modes of accumulating the necessary energy are considered, by successive electronic impacts and by resonance radiation from neighboring atoms. The probability of an electron attaining ionizing velocity in He and Hg at different pressures is calcd. and the conclusion is reached that at 2 to 10 mm., the pressure range in which the most intense low voltage arcs are obtained, effective single impacts are practically negligible. C. therefore defends his former claim to have been the first to demonstrate ionization in He below the ionization potential. Cumulative ionization also appears to be especially effective in temp. ionization as proposed by Saha (*C. A.* 15, 468). S. C. LIND

Mobility of gaseous ions. J. CABRERA FELIPE. *Rend. acad. ciencias, Madrid* 17, 64-107(1920); *J. phys. radium* 2, 17d. (Jan., 1921); *Science Abstracts* 24A, 572.—Using the Rutherford a. c. field method as modified by Franck and Lattey, F. obtains values for the mobility in air at 20° which are practically identical with Rutherford's early ones, namely: V_+ , 1.49 cm./sec.; V_- , 1.89 cm./sec. For the positive ions, V is a linear function of X/p , up to $p = 24$ mm. and $X/p = 0.5$; for the negative ions the same holds up to values of $p = 50$ mm., and $X/p = 0.5$, resp. At lower pressures the law expressing the behavior is more complicated. H. G.

The motion of electrons in argon. J. S. TOWNSEND AND V. A. BAILLY. *Phil. Mag.* 43, 593-600(1922).—T. and B. recently (*C. A.* 16, 681) described the motion of electrons in N, H and O. The present detns. show striking differences of behavior in A. When moving with a velocity of 10^4 cm. sec.⁻¹ an electron loses only 1/10,000 of its energy in a single encounter with A, as compared with 1% in the other gases. The mean free path in A at this velocity is about 10 times as long as in H, N or O. Tables and curves are given showing the electronic velocity in A and in N and H, and the effect of N as an impurity in A is discussed. The energy loss in an encounter in A is about 4 times what would be expected from perfectly elastic impact, and it is possible that the observed difference is due to impurities and not to internal energy imparted to the A mol. This can be more exactly detd. by working at lower electron velocities. S. C. LIND

The electron structure of heavy elements. L. DE BROGLIE AND A. DAUVILLIER. *Compt. rend.* 172, 1650-3(1921).—A new arrangement of electrons in K, L, M, N, O, P and Q levels is suggested for the inert gases and U, but a spectrographic study of the L series of U shows only 5 distinct layers instead of 7. This is explained by the conditions of the expt. in which the optical layer Q is broken up into free electrons and the electrons in the P layer are expelled from the atom by collisions resulting from a temp. of several thousand degrees in the U anticathode. The first layer conserving its integrity is the last layer revealed by the X-ray spectrum, for which the ionizing potential is about 60 v. W. F. MCGREGG

The path of a rigid electron which moves in a magnetic field of constant strength rotating with constant angular velocity. E. O. HULBURY. *Phys. Rev.* 19, 329-32(1922).—Math. treatment. F. O. A.

The frequency of inelastic collisions of electrons with mercury atoms. HERTHA SPONER. *Z. physik* 7, 185-200(1921).—The number of inelastic collisions which lead to the excitation of the resonance line 2536.7 Å.-E in Hg, thus transferring 4.9 v. energy to the atom, can vary by several %. This line corresponds to the transition $1.5S-2p_1$. The range of excitation for the transition $1.5S-2p_1$, which is excited by 4.7 v., can vary only through a range small in comparison to the above. Apparently the max.

number is at the point of the crit. velocity, which, for the excitement of the quantum intervals concerned, is the min. energy necessary.

A. E. STEARN

Electronic structure and spectral lines of heavy atoms. A. DAUVILLIER. *Compt. rend.* 173, 647-9(1921); cf. *C. A.* 15, 3926, 3935-6.—D.'s previous studies of the L series of W and U are extended to Au, Pt, Ir and Os. Six new lines are discovered. A table is given showing the wave lengths of 29 lines of the L series, mostly for all six elements. Origins are suggested for all the lines on the combination principle using the assumption of a very large no. of energy levels. The observed variations in intensity of certain lines are explained by assumptions of electron structures for the levels.

NORRIS F. HALL

Contact difference of potential and thermionic emission. O. W. RICHARDSON AND F. S. ROBERTSON. *Phil. Mag.* 43, 557-9(1922).—An exptl. test of the relation between the contact potential (V) and the thermionic electron satn. current (i_s) and (i_a) at 2 different metal surfaces at the abs. temp. T as expressed by: $V = kT/e \cdot \log(i_s/i_a)$, in which k is Boltzmann's const. and e the electronic charge. Using a thoriated filament of W contg. 1% Th as cathode and a coaxial cylindrical Cu anode at T 1480°, V was calcd. to be 0.96 v. compared with the measured value 0.71 v.

S. C. L.

Magnetic spectrum of the β -rays excited by γ -rays. C. D. ELLIS. *Proc. Roy. Soc. (London)* 99A, 261-71(1921).—The magnetic spectrum of the β -rays excited by the γ -rays of Ra B in U, Pb, Pt, W, and Ba has been measured. It is shown that the main lines are formed by electrons ejected from the K ring by definite γ -rays, each type of γ -ray being characterized by a certain energy. The magnetic spectrum of the β -rays of Ra B is accounted for on this basis. The magnetic spectrum of the low velocity β -rays of Th D has been measured and is explained in the same way as the Ra B β -ray spectrum. The wave lengths of the γ -rays of Ra B are calcd., on the basis of the quantum theory, from the characteristic energies found. Evidence is adduced to show that the greater the energy of binding of an electron the greater is the probability of it absorbing this hard γ -radiation.

J. C. S.

β -Ray spectra and their meaning. C. D. ELLIS. *Proc. Roy. Soc. (London)* 101A, 1-17(1922).—In a previous paper (cf. preceding abstr.) E. described some measurements of the magnetic spectrum of the β -rays ejected from various metals by the γ -rays of Ra B, and it was shown that the conversion of monochromatic γ -rays into β -rays was described by the same quantum relation that holds for X-rays and light. Besides giving an explanation of the line β -ray spectrum these expts. give a method of finding the wave lengths of γ -rays shorter than 0.07 Å., the limit obtainable by the crystal method. The first step is to measure the energies of the different lines in the natural β -ray spectrum of the body. If a certain line corresponds to an energy E_1 and is produced by the conversion of a γ -ray of frequency ν , $E_1 = h\nu - w_1$, where w_1 represents the work to remove the electron from its position inside the atom to the surface. To find ν it is necessary to det. w_1 and this is done by measuring the energy of the corresponding line in the excited spectra of a body of neighboring at. no. in which case the electron will come from the corresponding level but the work to remove it to the surface of the atom is w_2 . The difference $w_1 - w_2$ is found directly, and X-ray absorption data give w_2 when it is seen which of the corresponding levels of the 2 atoms differ by this amt. The γ -rays of Ra B, Ra C, and Th D have been investigated by these methods and measurements are given which extend the γ -ray spectrum to 0.0189 Å. It is shown that it is very probable that the γ -rays of radioactive bodies are emitted from the nucleus and evidence is brought to show that quantum dynamics applies and that part at least of the structure of the nucleus can be expressed in terms of stationary states. If these results are confirmed they will be of great importance in elucidating the inner structure of atoms and this paper concludes with suggestions for the arrangement of the nuclear levels of Ra B and Th D.

W. F. MCGOWAN

Influence of temperature on the sensitivity of emulsions in radiography. A. ZIMMERN. *Compt. rend.* 174, 453-5(1922).—Z. finds the photographic effect of X-rays on a plate increases with increase of temp., the d. being about doubled between 15° and 60°. With a fluorescent screen the effect is not observed. F. C. Hovr

Increase of accuracy of measurement in Röntgen spectra. MANNE SIEGBAHN. *Z. Physik* 9, 68-80(1922).—The method and app. for accurate measurement of X-ray wave lengths, by means of a crystal spectrograph, are described in detail under the following headings: adjustment, slit-and-line width, X-ray tube, and test results, in which the K_{α} radiation of Cu is derived as 1.537302 Å. with a probable error of about 0.002%. W. F. MEGGERS

A remeasurement of the radiation constant, h , by means of X-rays. WILLIAM DUANE, H. H. PALMER AND CHI-SUN YEH. *Proc. Nat. Acad. Sci.* 7, 237-42(1921).—Planck's const. h is detd. from the relation $eV = h\nu$ by measuring the wave length of the limit of the general radiation spectrum from W at about 25 kv. The precision of previous workers is increased by an improved method for measuring the voltage with a potentiometer and calibrated high resistance and careful correction for finite width of the slit. The result is $h = (6.556 \pm 0.009) \times 10^{-24}$ erg sec. No variation in the limit with the angle of the X-rays with the cathode stream was detected. F. C. Hovr

The X-ray fiber diagram. M. POLANYI. *Z. Physik* 7, 149-80(1921).—P. discusses the optics of the reflection of monochromatic X-rays from a mass of crystal particles that have the normals to one or more sets of at. planes oriented so as to make a given angle with some axis, called the "fiber axis." With complete irregularity of arrangement, as in the Debye-Scherrer method, the trace of the reflected beam on a photographic plate at right angles to the incident beam is a circle. With an orientation of this kind the circle degenerates in general into 4 points, from the positions of which the direction of the fiber axis can be found. Various special cases are discussed, such as orientation in more than one direction, and distribution of the orientation about a most probable value. F. C. Hovr

Dependence of the general X-radiation on the direction of emission. A. MARCH. *Physik. Z.* 23, 84-6(1922).—Disagreement of the results of the last paper (cf. *C. A.* 15, 3935) with expts. of Wagner (*C. A.* 15, 1252) and Friedrich (*C. A.* 7, 447) can be traced to an unallowable approximation in the calcs. The corrected calcn. gives an intensity that is a min. at 0° and 90°, with a max. at an intermediate value that depends on the frequency. This is in accord with expt. and explains the change in hardness of the beam with azimuth. The law of energy distribution is also to be corrected. F. C. H.

The absorption of X-rays. I. K. A. WINGARDH. *Z. Physik* 8, 363-76(1922).—W. measures the absorption coeffs. of 31 elements for the K_{α} radiation from a Mo target. Most of these are obtained from measurements of the absorption of solns. of salts in water, an additive law being assumed. A differential ionization method is used to allow for variation in the intensity of the primary beam. F. C. Hovr

The absorption of X-rays by matter and the principle of correspondence. LOUIS DE BROGLIE. *Compt. rend.* 173, 1456-8(1921); cf. *C. A.* 16, 1041.—By use of classical radiation theory with quantum theory as in Bohr's correspondence principle B. calculates the const. A in the expression $A\lambda^3N^4$ for the at. absorption coeff. for wave length λ of an element of at. no. N . The agreement is to within about 1% with the exptl. value. F. C. Hovr

The structure (of the X-ray spectra) of elements of intermediate atomic weights. A. DAUVILLIER. *Compt. rend.* 173, 1458-61(1921).—D. gives the results of spectroscopic investigations of the K and L series of these elements, consisting mostly of the details of the fine structure of the lines. F. C. Hovr

The importance of the Laue diagram in crystallography. PAUL NIGGLI. *Naturwissenschaften* 10, 391-9(1922).—Extensive data are given, but no new research.

C. C. DAVIS

Procedures for the study of crystals by X-rays. FRANCOIS CANAC. *Ann. phys.* 15, 153-246(1921).—C. describes 2 new methods for detg. the parameters of a crystal and the arrangement of lattice planes parallel to a zonal axis. A beam of *general radiation* from a Coolidge tube is employed in both. (1) The zonal axis is made perpendicular to the photographic plate or fluorescent screen and the incident ray strikes the crystal at an angle of 10 or 15° with this axis. Each lattice plane parallel to the zonal axis then reflects rays of some wave length, and it is shown that the reflected spots will lie on a circle. Their disposition is characteristic of the symmetry of the axis, and the arrangement is calcd. for typical cases and compared with expt. From the angular arrangement the axial ratios can be found. This is done for NaCl and sugar. (2) In this method the crystal is rotated about an axis perpendicular to the plane detd. by the incident ray and the zonal axis. The reflected spot from a given plane of the zone then describes a lemniscate. From the geometry of these angular distances between planes can be found and hence axial ratios to an accuracy of about 0.1%. Application is made to NaCl and sugar only. In both methods the relative intensities of the spots and the wave lengths reflected to each can be approx. calcd. There is a general description of other methods.

F. C. HOYT

Calculation of X-ray absorption frequencies of the chemical elements. WILLIAM DUANE. *Proc. Nat. Acad. Sci.* 7, 267-73(1921).—D. calcs. the K absorption frequencies, making use of the usual assumptions of the Bohr theory, and using an arrangement of the electrons in "shells" suggested by the Lewis-Langmuir theory. The electrons are supposed to rotate in circles. Except the first orbit, which is about the nucleus as center, they occur in pairs that are parallel and symmetrical with respect to the nucleus. The first inner orbit contains 2 electrons, the next shell (2 parallel orbits) 8, the third 8, and the fourth 18 as in Langmuir's arrangement. In finding the force on an electron in a given orbit the effect of those in outer orbits is neglected entirely, while for those inside the effect is taken to be the same as though they were concd. at the nucleus. For the effect of electrons in the symmetrical orbit 2 assumptions are tried: (1) the effect is the same as though half the electrons were at the point which is the reflection of the electron for which the force is being calcd. and half were diametrically opposite this point, and (2) the electricity in the second orbit is distributed continuously. The quantum nos. for the orbits are taken to be 1, 2, 2, 3, 4. On either of the above assumptions the total energy of the electron systems can be calcd., and hence the frequency from Bohr's equation. With (1) the agreement with expt. is within 2%, and is larger for (2). An entirely different arrangement gives values not very different, and the method is not a very sensitive one for detg. the positions of electrons.

F. C. HOYT

New precision instruments in the X-ray spectrum. M. SIEGBAHN. *Compt. rend.* 173, 1350-2(1921).—With an improved form of app. S. finds for the K radiation of Cu the value 1537.302×10^{-11} cm. Deviations from Bragg's law as observed by Stenström for gypsum were found for calcite also.

F. C. HOYT

X-ray research by the Debye-Scherrer method; length of side of elementary lattice of molybdenum. P. STOLL. *Arch. sci. phys. nat.* 3, 546-7(1921); *Science Abstracts* 25 A, 51.—S. detg. by the Debye-Scherrer powder method the structure of Mo. The length of the side of the elementary cubical lattice is given as 3.08×10^{-8} cm. A brief reference is also made to an investigation of the *coagulation of colloidal Au*.

H. G.

Report on the latest developments of Röntgen spectroscopy. (Experimental

technic and observational data.) M. SIEGRAHN. *Jahrb. Radioakt. Elektronik* 18, 240-92(1922).—Continuing an earlier report (C. A. 13, 296) the more important data of X-ray spectroscopy are reported. The list of all papers on the subject is extended to the middle of 1921. The wave lengths of all X-ray lines are tabulated. Full but concise instructions for the excitation and observations of X-ray spectra are given, and this section of the paper should be of great use to students of the subject.

K. BURNS

Ten years of Röntgen spectroscopy. PAUL KNIPPING. *Naturwissenschaften* 10, 366-9(1922).

C. C. DAVIS

Recent results in Röntgen spectroscopy. GREGOR WENTZEL. *Naturwissenschaften* 10, 369-81(1922).—Numerous references are given.

C. C. DAVIS

The optics of hydrogen according to the Bohr-Debye model. RICHARD GANS. *Z. physik* 9, 81-91(1922).—Mathematical. • The refraction and dispersion and the Tyndall and Kerr effects (elec. double refraction) of H are calcd. and compared with exptl. data.

NORRIS F. HALL

A discharge tube for demonstration of the Stark effect. H. GEHRCKE. *Z. tech. Physik* 3, 93-4(1922).—A discharge tube in which canal rays pass between 2 metal plates behind the cathode is described. When a field is applied to the plates the spectral lines of the gas in the tube are split up. Such a tube is very suitable for demonstrating the Stark effect in lectures or in the class room.

C. C. KIESS

The vacuum-spark spectra of the metals. EDNA CARTER. *Astrophys. J.* 55, 162-4(1922).—Vacuum-spark spectra of Ca, Mg, Cd, Ti, and Fe were photographed by means of a 20-cm. grating. By means of a dyed film the spectrum of Fe was extended to $\lambda 6600$. In the case of Ca and Mg the vacuum spark shows the same spectrum as the spark in air. In the case of Cd the arc lines are somewhat more intense, and with Ti decidedly more intense, than in the spark in air. The vacuum-spark spectrum of Fe resembles the arc rather than the spark in air. The new spectra resemble the luminescence produced by cathode-ray bombardment in high vacuum, the conditions of emission being no doubt quite similar in the 2 cases.

K. BURNS

The excitation of the enhanced spectra of sodium and potassium in a low voltage arc. PAUL D. FOOTE, W. F. MEGGERS, AND F. L. MOHLER. *Astrophys. J.* 55, 145-61(1922); cf. C. A. 16, 874.—The quantum theory indicates that the enhanced spectra of the alkalis should be excited at rather low voltages. Since this is contrary to the general belief that high voltages are necessary to excite these spectra spectrograms were made of the light excited by low voltage electrons in a special cylindrical tube. The distance between the central W filament, which supplied the electrons, and the accelerating grid was so small and the pressure was so low (0.1 to 0.2 mm. of Hg) that all the electrons entered the force-free space surrounding the grid with the same energy. The voltages used varied from 3.5 to 5000 for Na, and from 3.5 to 40 for K. The results completely verify the theoretical conclusions, as is clearly shown by tables and photographs of the three-stage development of these spectra. Single pair stage: 2.1 to 5.1 v. (Na); 1.6 to 4.3 v. (K). Arc stage: 5.1 to 30 v. (Na); 4.3 to 20 v. (K). Enhanced stage: above 30 v. for Na, and above 20 v. for K. With a current of 1 amp. at 7 v. in K, the pair at $\gamma 4642$ is very prominent, though its notation is (1s-3d). It is not due to Stark effect and furnishes an exception to the principle of selection. The wave lengths are given for 250 lines, and the series notation, when known.

K. BURNS

The mechanism of continuous light radiation. J. DUCLAUX. *Compt. rend.* 173, 1355-7(1921).—D. proposes the following hypothesis: Continuous emission and absorption depend on the formation and rupture of chem. bonds between atoms. In the reversible case the formation of a bond corresponds to the emission of a quantum of energy. This hypothesis can be used to explain the optical behavior of gases.

F. C. HORT

Theory of the abnormal Zeeman effect. P. DAS. *Calcutta Math. Soc. Bull.* 12, 67-78 (Sept., 1921); *Science Abstracts* 25 A, 44.—Sommerfeld (*Physik. Z.* 17, 491-507 (1916)), using Bohr's at. model, applied the quantum theory to account for the normal Zeeman effect, but his treatment had no marked advantage over the classical electromagnetic theory, in so far as the Zeeman effect is concerned. Sommerfeld's paper is open to criticism since he neglected the squares of the magnetic field. In the present mathematical paper it is shown that these terms are responsible for the asymmetry observed by Gmelin and Dufour. An at. model is described, which, though somewhat speculative in character, explains Runge's law of multiple resolution. This law may be stated thus: The distances of the lines from the central component are exact multiples of an aliquot part of the normal resolution. An extension of the dynamics of the H ion leads to the result that a part of the secondary spectrum of H should not show the Zeeman effect. The paper concludes with an investigation of the dynamical features of an H atom in a magnetic field, taking relativity into account. In a subsequent paper the intensity and polarization of the lines will be dealt with. H. G.

Degradation of the quantum in the successive transformations of high frequency radiation. LOUIS DE BROGLIE. *Compt. rend.* 173, 1160-2 (1921).—The transfer of radiant energy from higher to lower frequencies when secondary radiation is produced is analogous to the transfer of heat from high to low temp. L. discusses this analogy, and shows that it may be extended to a definition of radiant entropy as energy emitted divided by the frequency at which it is emitted. F. C. HOYT

The electric birefringence of liquid mixtures and crystalline structure. STEPHEN PROCOPIU. *Compt. rend.* 172, 1172-5 (1921); cf. *C. A.* 14, 3368; 15, 983.—An attempt to det. whether there is any relation between the cryst. structure of a suspended powder and the elec. refraction of the liquid. Hg radiation (0.578μ) was passed successively through a Nicol prism, a Kerr condenser contg. the filtered suspension and a penumbra analyzer. In PhMe and C_6H_6 a positive refraction is obtained with calc. spar, quartz, $NaNO_3$, K_2SO_4 , H_3BO_3 , glass, citric acid, $PhCO_2H$, Na citrate, $C_{10}H_8$, $Ca(O_2CPh)_2$, and $MgNH_4PO_4 \cdot 6H_2O$, and a negative with Zr, $PhCO_2NH_4$, *p*-toluidine and Rochelle salt. The sign of birefringence is calcd. with the direction of the lines of force as axis. If only the birefringence of the crystals is measured, the liquid is positive, but if the optical and elec. dissymmetry do not correspond, the liquid should be negative. Calcs. of the Kerr const. gave: pure PhMe $+7.10^{-3}$; 555 g. of $PhCO_2H$ per l. of PhMe $+10$; 80 g. of *p*-toluidine per l. of PhMe 0 (concd. solns. gave a negative const.); pure C_6H_6 $+3.10^{-3}$; 200 g. of $C_{10}H_8$ per l. of C_6H_6 $+5$. Since orientation of the cryst. particles does not depend on the liquid medium, all liquids with the same solid suspension should have the same birefringence. But it was found to diminish for liquids with greater or less index than the solid. Calc. spar gave a birefringence of satn. in CS_2 $+17^\circ$; homo-benzyl alc. $+14^\circ$; PhMe $+5^\circ$; gasoline -0.6° ; *n*-butyl alc. -1° ; petroleum ether -1° and Me_2CO -1.7° . It is concluded that this is due to the particles acting as parallel filaments in the elec. field. The birefringence arises from a positive value due to the crystals and to a negative value due to their arrangement. The signs of these birefringences are changed for crystals in which the optical and elec. dissymmetry do not coincide. C. C. DAVIS

Spectroscopic method for the detection of the formation of complex salts in dilute solutions. YUJI SHIBATA, TOSHI INOUE AND YUICHI NAKATSUKA. *J. Chem. Soc. Japan*, 42, 983-1005 (1921).—S. has noted before (*C. A.* 14, 143) that complex salts extend their adsorption bands toward longer wave lengths in the ultra-violet zone than their component salts and that any tendency to form more complex salt shifts the band toward longer wave lengths. This phenomenon is used to det. whether or not any given two salts form a complex salt in a soln. Two salt solns. (A and B, ordinarily less

than 0.1 *N*) are mixed in the following ratios: 100:0, 95:5, 90:10, 85:15, 80:20, 75:25, 70:30, 65:35, 60:40, 55:45, 50:50, 45:55, 40:60, 35:65, 30:70, 25:75, 20:80, 25:75, 10:90, 5:95, 0:100. Spectroscopic analyses of these 21 combinations were made and the results are plotted, with A^c as ordinates and AB as abscissas. If there is no complex salt formation, the curve will be a straight line, but if there is, the curve has a max. point, at which compn. of the complex salt can be easily calcd. When A has selective absorption, and B does not, the curve may have more than one crit. point. Hg salts form complex salts with most metals. The compn. of such salts are: $\text{HgCl}_2\text{-HCl}$ (0.127 *N*) 1:1, $\text{HgCl}_2\text{-NH}_4\text{Cl}$ (0.1 *N*) 1:1, $\text{HgCl}_2\text{-NaCl}$ (0.125 *N*) 1:1, $\text{HgCl}_2\text{-KCl}$ (0.1 *N*) 1:1, $\text{HgCl}_2\text{-MgCl}_2$ (0.127 *N*) 1:1, $\text{HgCl}_2\text{-ZnCl}_2$ (0.1 *N* in 0.002 *N* HCl) 1:1, $\text{HgCl}_2\text{-CdCl}_2$ (0.1 *N*) 1:1, $\text{HgCl}_2\text{-CaCl}_2$ (0.127 *N*) 1:1, $\text{HgCl}_2\text{-SrCl}_2$ (0.1 *N*) 1:1, $\text{HgCl}_2\text{-BaCl}_2$ (0.1 *N*) 1:1, $\text{HgCl}_2\text{-MnCl}_2$ (0.1 *N*) 1:1, $\text{HgCl}_2\text{-CoCl}_2$ (0.1 *N*) 1:1, $\text{HgCl}_2\text{-NiCl}_2$ (0.1 *N*) 1:1, $\text{HgCl}_2\text{-AlCl}_3$ (0.1 *N*) 1:1, $\text{HgCl}_2\text{-ZrCl}_4$ (0.025 *N*) 1:1, $\text{HgCl}_2\text{-SnCl}_4$ (0.1 *N* in 3 *N* HCl) 1:1, $\text{HgCl}_2\text{-[Co(NH}_3)_6\text{]Cl}_3$ (0.01 *N*) 1:1, $\text{HgCl}_2\text{-NH}_4\text{Br}$ (0.1 *N*) 1:4, $\text{HgCl}_2\text{-NaBr}$ (0.1 *N*) 1:1, $\text{HgCl}_2\text{-KBr}$ (0.1 *N*) 1:1, $\text{HgCl}_2\text{-ZnBr}_2$ (0.1 *N*) 1:2, $\text{HgCl}_2\text{-CoBr}_2$ (0.01 *N* in alc.) 1:1, $\text{HgCl}_2\text{-CdCl}_2$ (0.1 *N*) 2:3, $\text{HgCl}_2\text{-CdI}_2$ (0.001 *N*) 1:2, $\text{HgCl}_2\text{-KCN}$ (0.1 *N*) 2:1 (?), $\text{HgCl}_2\text{-Co(SCN)}_2$ (0.1 *N*) 1:1, $\text{HgCl}_2\text{-Co(SCN)}_2$ (alc. soln.) (0.001 *N*) 1:4, $\text{Hg(CN)}_2\text{-BaCl}_2$ (0.1 *N*) 1:1, $\text{Hg(CN)}_2\text{-KBr}$ (0.1 *N*) 1:1, $\text{Hg(CN)}_2\text{-CdI}_2$ (0.001 *N*) 1:4, $\text{Hg(CN)}_2\text{-KSCN}$ (0.05 *N*) 1:1, $\text{Hg(SCN)}_2\text{-KSCN}$ (0.001 *N*) 1:1, $\text{Hg(SCN)}_2\text{-Co(SCN)}_2$ (0.001 *N*) 1:1. The forms in which these salts exist in soln. are probably as

follows: In univalent metals, $[\text{HgCl}_2(\text{H}_2\text{O})]^\pm\text{M}$, or $\text{HgCl}_2(\text{H}_2\text{O})^\pm\text{M}$; for bivalent $(\text{HgCl}_2)_2^\pm\text{M}$, or $[\text{HgCl}_2(\text{H}_2\text{O})_2]^\pm\text{M}$; trivalent, $(\text{HgCl}_2)_3^\pm\text{M}$, or $[\text{HgCl}_2(\text{H}_2\text{O})]^\pm\text{M}$; and quadrivalent, $[\text{HgCl}_4]^\pm\text{M}$. HgCl_2 did not give positive results with chlorides of Ca,

Sh, Cr, Fe, $[\text{Co}(\text{NH}_3)_4\text{C}_2\text{O}_4]$, $[\text{Co}(\text{NH}_3)_4\text{Cl}]$, nor with Hg(SCN)_2 ; sulfates of Na, K, Mg, and Cd. Hg(CN)_2 shows negative results with NaCl, Co(SCN)₂, Hg(SCN)₂, KCN, BaCl₂, FeCl₃, ZrCl₄, KBr, CdI₂, KCN and $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$ in 0.001 *N* solns. The combinations of 2 other different salts are reported. Among notable results are: Both NH₄ and CO(NH₂)₂ do not form complex salts with salts of alk. and alk. earth metals (0.5 *N*); I and KI in 0.0005 mol. soln. form KI₃. Some mixts. that are known to form cryst. complex salts do not, however, show the presence of the complex salt in soln., probably owing to decompn. in H₂O. This method can be applied to a mixt. of more than 2 salts.

S. T.

The molecular scattering of light in water and the color of the sea. C. V. RAMAN. *Proc. Roy. Soc. (London)* 101A, 64-80(1922); cf. *C. A.* 16, 529.—The paper puts forward the theory that the color of the sea is due to the scattering of light by the H₂O mols. The intensity of mol. scattering in H₂O can be calcd. from the "theory of fluctuations" of Einstein and Smoluchowski and is found to be in round nos. 160 times that in dust-free air, which agrees with expt. The coeff. of extinction of light in H₂O calcd. from theory also agrees with the observed value in the parts of the spectrum in which there is no selective absorption. A sufficiently deep layer of pure H₂O exhibits by mol. scattering a deep blue color more saturated than skylight and of comparable intensity. The color is primarily due to diffraction, the absorption only making it of a fuller hue. The theories hitherto advanced that the dark blue of the deep sea is reflected skylight or that it is due to suspended matter are discussed and shown to be erroneous.

E. P. WIGHTMAN

Selected radiations emitted by specially excited mercury atoms. H. J. C. IRBYTON. *Trans. Roy. Soc. Canada* 1921, Section III, 131-40.—Expts. conducted with a specially constructed Hg-arc lamp (fully described and illustrated) were carried out to test an hypothesis based upon Bohr's atom and spectral series. In particular an attempt

was made to det. if Hg atoms emit radiations of the wave lengths, $\lambda = 5460.97 \text{ \AA. U.}$ and $\lambda = 4048.78 \text{ \AA. U.}$ when they have previously been made to absorb successively light of the wave lengths $\lambda = 2536.72 \text{ \AA. U.}$ and $\lambda = 4358.86 \text{ \AA. U.}$ The results obtained lend support to the idea.

E. G. R. ARDAGH

The structure of the band spectrum of helium. W. E. CURTIS. *Proc. Roy. Soc. (London)* 101A, 38-64(1922).—The band spectrum of He was first described in 1913 but no analysis of its structure was then attempted. In view of the somewhat complex character of the spectrum in certain regions and the apparently abnormal nature of many of the bands it has now been studied with larger dispersion. Grating photographs of 3 of the principal He bands (4550, 5730 and 6400 \AA) were measured and analyzed with the following results. Tables showing wave lengths, intensities, wave-numbers and allocation are given, also photographs and diagrams exhibiting the structure of the bands. The chief features of their structure are shown to be accounted for by the quantum theory of band spectra which attributes band spectra to mols. treated as rigid bodies possessing internal and rotational energy, either or both of which may vary, giving rise to emission or absorption of energy in the form of radiation. A brief outline of the theory is given and 3 common types of series, the general terms $R(m)$, $Q(m)$, and $P(m)$ representing the positive, null and negative branches, resp., are discussed. In each of the 3 bands a new type of series $P'(m)$ is found which, although closely related to the others, has not yet received a theoretical explanation. Other departures from the theory are also noted and the suggestion is advanced that some of the deviations may be explained in part by deformation of the mol. due to centrifugal force. It is concluded that the band spectrum of He is due to an unstable He mol., having a moment of inertia of $1.8 \times 10^{-40} \text{ g.-cm.}^2$.

W. F. MEGGERS

A new method for absorption spectrography. WALTER GERLACH AND ERICH KOCH. *Ber.* 55B, 695-7(1922).—Light sources heretofore used for absorption spectrography have either insufficient constancy or too little intensity. An Fe wire (0.031 mm. diam.) exploded by the passage of a high-potential condenser (30000 cm. capacity) discharge across a spark gap of 26 mm. is found to be a satisfactory source of light since it is exceedingly intense and exactly reproducible, its constancy depending only on the capacity, spark-gap and diam. of wire.

W. F. MEGGERS

Convection of light (Fizeau effect) in moving gases. C. V. RAMAN AND NIHAL KARAN SETHI. *Phil. Mag.* 43, 447-55(1922).—A preliminary account of expts. to test the drift of ether in a moving gas (air). Inconclusive indications of a slight shift of fringes on reversing the air current were obtained. Greater air velocities and a more rigid elimination of temp. effects will be necessary in order to draw final conclusions.

S. C. L.

Visible refraction and dispersion of water-soluble salts, especially colored ones. G. LIMANN. *Z. physik* 8, 13-19(1922).—L. measures the refractive indices of 36 salts at 4 concns. and for 4 different wave lengths. From these data dispersion consts. are calcd. For KBr the effect of changing the temp. from 6° to 30° is to increase the dispersion considerably. All other measurements were at 18° with a Pulfrich refractometer.

F. C. HOYT

A study of the absorption of light by solutions of cupric lithium chloride. F. H. GRIMAN. *J. Phys. Chem.* 26, 377-83(1922).—The absorption of light by solns. of $\text{CuCl}_2 \cdot \text{LiCl} \cdot 2\text{H}_2\text{O}$ was studied by means of the spectrophotometer, and the resulting absorption curves when compared with corresponding curves previously obtained for solns. of CuCl_2 show that the minima in the former lie nearer the red end of the spectrum than the corresponding minima in the latter. In dil. solns. the curves were found to be identical for both salts. From a comparison of the cond. of solns. of $\text{CuCl}_2 \cdot \text{LiCl} \cdot 2\text{H}_2\text{O}$ with the sum of the cond. of LiCl and CuCl_2 at the same diln., it was found that

the double salt, when dissolved in H_2O , undergoes almost complete dissociation into the 2 component salts. The possibility suggested by Donnan that the solid salt may undergo dissociation as indicated by the equation $CuCl_2 \cdot LiCl \cdot 2H_2O \rightleftharpoons (Li \cdot 2H_2O)^+ \cdot (Cu \cdot 3Cl)^-$ is emphasized as offering a satisfactory explanation of the fact that the color of the compd. departs widely from that which is characteristic for Cu salts.

E. P. W.

Application of photoelectric cells to the measurement of light absorption in solutions. II. H. v. HALBAN AND K. SIEMENOFF. *Z. physik. Chem.* 100, 208-30(1922); cf. *C. A.* 15, 343.—An arrangement is described for the measurement of the absorption of light by means of photoelec. cells, by which fluctuations in the brightness of the Hg lamp are eliminated. This is done by employing 2 cells on the compensation principle. The cells are used only as a null instrument. For measurable weakening of the light a rotating sector and gray wedge are used. In measurements of the abs. value of the extinction coeff. with the sector, the greatest deviations of a single measurement from the mean is about 0.5%. Measurements with the wedge permit the testing of the identity of 2 objects to about 0.1% with respect to their absorption of light. Measurements have been carried out with solns. of K_2CrO_4 and KOH, equimol. quantities of K_2CrO_4 and $CuSO_4$ in NH_4OH , $C_6H_5N:N(C_6H_5)_2$ in EtOH, and C_6H_5I in EtOH, using the wave lengths of the lines of the Hg arc between 579 and 254 $\mu\mu$. H. JERMAIN CARRINGTON

Boron trioxide-hydrate as a component of highly phosphorescent systems containing organic compounds. F. TIENR AND P. WULFF. *Ber.* 55B, 588-97(1922); cf. *C. A.* 15, 1459, 1460.—Further investigation has shown that phosphorescence observed with boric acid is due to the presence of small concns. of organic impurities. A new class of phosphorescent boric acids, which after being illuminated for a time gives out an intensive after-glow, has been prepd. by imbedding different organic compds. in orthoboric acid, and subsequently dehydrating. In this way phosphorescent boric acids have been obtained with fluorescein, uranine, phenolphthalein, $C_6H_5CO_2H$, quinine, $C_6H_5NH_2$, $C_6H_5N(CH_3)_2$, $(C_6H_5)_2NH$, C_6H_5OH , $1,4-C_6H_4(OH)_2$, C_6H_5OH , $1,4-C_6H_4(CO_2H)_2$, C_6H_5N and C_6H_5N . The phosphorescent substances can be obtained either as a transparent melt, or in a slightly sintered form which is easily powdered. The prepn. of the boric acid-terephthalic acid and the boric acid-urarine preps. is described in detail.

H. JERMAIN CARRINGTON

Destruction of phosphorescent zinc sulfides by ultra-violet light. L. B. LOBA AND I. SCHMITZSKAMP. *Proc. Nat. Acad. Sci.* 7, 202-7(1921).—It has been assumed that the process of phosphorescence exhibited by the Zn sulfides was similar in nature to the process of fluorescence exhibited by many solid substances and solns., except that in the cases of phosphorescence the phenomenon continued for an appreciable time after the exciting light was removed. Recent expts. by Perrin and Wood have shown that in the act of fluorescing, the fluorescent mol. is chemically changed and thus loses its power of fluorescence. The results of expts. are given in which it was attempted to find similar effects for the case of the phosphorescence of the Zn sulfides. Illumination for several hundred hours by ultra-violet light of thin layers of different Zn sulfides placed at the focus of a quartz lens resulted in a marked decrease in the intensity of the phosphorescence. In one case this intensity was reduced to $1/3$ its initial value. This destruction of the phosphorescence is accompanied by a blackening of the sulfide crystals resembling the darkening of an X-ray bulb. The power of phosphorescence as well as the normal color could be restored to the sulfide by the action of dil. Cl_2 gas on it. The conclusion is that it is not unlikely that phosphorescence and fluorescence are similar processes for both seem to be accompanied by a chem. change in the substance acting. In the case of Zn sulfides it seems probable that this action of light is a reducing action for the properties are restored by an oxidizing agent.

L. B. LOBA

Investigations on the fundamental law of photochemistry. II. Influence of coloring of dyes on the absorption of light. P. LASAREV. *Z. physik. Chem.* 100, 286-70 (1922); cf. *C. A.* 15, 3590.—The absorption of light by cyanine and by pinacyanol in colloidal has been measured at room temp. and at the temp. of liquid air, using a no. of different wave lengths between 543μ and 644μ . With all wave lengths (λ) the quantity of light absorbed (Q) is slightly less at the lower temp.; while at both temps., as λ increases Q at first increases, reaches a max. and then diminishes. H. J. C.

Photolysis of uranyl oxalate. E. BAUR. *Z. physik. Chem.* 100, 38-41 (1922).—The photolysis of $\text{UO}_2\text{C}_2\text{O}_4$ was studied at 12° by subjecting a mixt. of UO_2SO_4 , $\text{H}_2\text{C}_2\text{O}_4$ and aq. H_2SO_4 to the action of sunlight and detg. the quantities of CO_2 , O and CO evolved. It was found that HCO_2H was present in only a very small quantity during photolysis. In the evolved gas the oxides of C were present in the ratio $\text{CO}_2:\text{CO}$. The uranyl salt was gradually reduced to the urano-salt. H. JERMAIN CREIGHTON

Determination of Kr and Xe by spectrophotometry (MOUREU, LEPAGE) 7. Explosive potentials in carbon dioxide under pressure (GUYE, MERCIER) 2. Unsymmetrical addition to the double bond. I. A theory of the reaction mechanism of the direct union (PERKINS) 10. The dissociation of hexaphenylethane from the viewpoint of the octet theory of valence (COLLE) 10. The crystal structure of quartz (HUGGINS) 2. Space formulas (RINNE) 2.

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4—ELECTROCHEMISTRY

COLIN G. FINK

Electrochemistry and electrometallurgy. P. BUNET. *Soc. franç. élec. bull.* [4] 1, 325-36 (1921).—This is an address dealing in a general way with electrochem. problems, more particularly in regard to the power factor of elec. furnaces. H. G.

The Fiat electric furnace. ANON. *Engineering* 113, 421-2 (1922).—About 60 Italian firms now have elec. furnace equipment. There are about 100 small furnaces of about 1 ton which work only a few mos. during the year. In northern Italy there are now 22 15-ton Heroult furnaces and 16 of 5-8 ton capacity. The Fiat furnace has been in constant operation for the last 5 yrs. There are now four 20-ton and 12 smaller (3-6 ton) furnaces in operation at the Fiat plants. The furnace is cylindrical in shape, 3-phase type, with the hearth slightly conductive and connected to ground. A characteristic feature is the "economizer" or electrode holder which completely encloses the furnace roof. This is a water-cooled cylinder, fitted with insulating rings to guide the electrode, and prevents their wasting. The design provides for ease of access for maintenance. The sides of the electrodes remain parallel and carry greater current down inside the furnace, thus reducing the working time. The electrode consumption is 6.3 lbs. per ton of steel. The av. power required is 650 kw. hrs. per ton. Roof and linings last about 150 heats, and clamps have not needed renewal in 5 years. It has been possible to reach 9 heats per 24 hrs. starting from a cold charge. W. E. RUDER

Operation of the electric blast furnace. STROLLS. *Res. metal.* 19, 30-40 (1922).—A discussion of the effect of rapid changes in temp. upon the composition of the gas in the mouth of the furnace and the quality of the melt due to the resulting equilibrium between coke and ore, with special reference to the method of charging and the descent of material in the furnace.

W. A. MURRAY

Cost of heat-treated parts reduced to a minimum by electric furnace. C. L. IPSSEN. *Elec. World* 79, 1125-6 (1922).—Detailed cost figures and comparative figures for oil furnace are given.

C. G. F.

Electric furnace iron and steel. Intermittent and alternating operations. W. E. CAHILL. *Trans. Am. Electrochem. Soc.* 41 (preprint Apr., 1922); *Iron Age* 109, 1277-8 (1922).—Elec. furnace Fe castings have been made at Treadwell, Alaska, since 1918, where it has been found cheaper than possible with a cupola. The av. power consumption for 25 consecutive heats of iron and steel with 2-voltage control shows a saving of 75 kw.-hrs. per ton of Fe and 42 kw.-hrs. per ton of steel. Cast iron was made with 784 kw.-hrs. per ton, and steel with 893 kw.-hrs. per ton. Intermittent operation is most severe on electrodes and roof. A good spout is of prime importance so that the furnace will drain. Cast gray iron of a uniformly fine-grained structure and low S, free from occluded gases, is obtained. The removal of S depends upon the length of time the metal is held under a carbide slag.

W. E. RUDER

The melting of cast iron in the Booth rotating electric furnace. H. M. WILLIAMS AND T. B. TERRY. *Trans. Am. Electrochem. Soc.* 41 (preprint Apr., 1922). Results of research with a small (250 lb.) elec. furnace are described. 750 heats have been made, and the furnace is now making 15 heats per week. Satisfactory castings have been made from boiler-plate, ferro-silicon and C; malleable from borings and steel; and iron alloys of various kinds. Refining by slagging is not possible with this type of furnace.

W. E. RUDER

An adaptable electric steel company. S. G. KOON. *Iron Age* 109, 1196-1202 (1922).—A description of the melting, heat-treating and forging equipment of the Sizer Steel Co.'s plants at Buffalo and Syracuse. Two 12-ton Heroult furnaces, each making 4 heats per day, receive power from Niagara. All other heating is done with pulverized coal. Crank shafts, connecting rods, die blocks, stern and rudder frames, balls, rod and bars are produced. Illustration of equipment and layout are given.

W. E. R.

Electric furnace melting. W. H. KREN. *Chem. Met. Eng.* 26, 869-70 (1922).—Elec. furnace processes should be compared with the open-hearth and not the crucible process, though the product may resemble that of the latter. For this reason an open-hearth melter is usually better adapted to elec. furnace operation than a crucible melter. It is quite possible to make high-grade steel from poor scrap in the elec. furnace, but it is usually not advisable from a cost viewpoint. Al should not be used to correct improper working, but a little should be added, to insure complete deoxidation.

W. E. RUDER

Electric tool steel melting practice. W. J. GREEN AND S. S. GREEN. *Iron Age* 109, 999-1001 (1922); cf. *C. A.* 16, 23, 685.—The major aspects of (a) acid vs. basic bottom, (b) liquid vs. cold charge, and (c) double vs. single voltage are discussed. The basic bottom is preferred, not on account of refining the charge, but because of its ability to carry a strongly reducing slag, atm. and general melting practice. Cold charges are preferred, as open-hearth metal, impoverished by its melting conditions, cannot be fully rejuvenated by ordinary elec. furnace methods. Crucible quality may only be obtained by melting high-grade cold charges. Double voltage of 115-125 high to 75-85 low is satisfactory. Higher voltages are at present satisfactory only for medium or cheaper products. A single voltage of 95 is a satisfactory all-round pressure, in life of refractory, output and quality of product.

W. E. RUDER

High-frequency induction furnace. G. RIBAUD. *Bull. official direction recherches sci. et inventions* 3, 178-83(1922).—R. describes a small induction furnace with which he was able to melt 80 g. of wrought Fe (1400-1500°) in less than 1 min. with an input of 5 kw.; while with 8 kw. in 1 min. he reached the m. p. of Pt, and the rate of heating indicated that the final temp. would have been considerably over 2500°. He discusses the mathematical theory of induction furnaces and concludes that with an 8 kw. furnace temps. of over 3000° can be attained. A. P.-C.

Electric furnace melting. H. NEEHAM. *Chem. Met. Eng.* 26, 871(1922).—The selection of the correct elec. system is the secret of the com. success of an elec. furnace. The elec. furnace depends not upon any cleansing action so much as upon the absence of contaminating impurities. Modern furnaces are fitted with tight doors, electrode economizers and flame muffling devices, which make them very highly efficient. The use of small or large amts. of Al is purely a question of skilled metallurgy. W. E. R.

Melts aluminium in electric furnace. H. E. DILLER. *Foundry* 50, 345-51(1922).—A description of an elec. installation and a comparison of results with crucible and elec. furnaces. The furnace consists of a large steel shell on trunnions and swung by a hand wheel. The body and cover are lined with insulating material and fireclay brick. Two electrodes are connected with resistance formed of small particles of C held in a carborundum trough, which extends completely around the furnace at the height indicated by the electrodes. The heat is reflected to the roof and down upon the metal. The metal is charged through a door in the rear and is rabbled during the melting operation through a rear door. The bath is fluxed with cryolite. The hand ladles used are preheated. It requires 728 kw. to melt 1 ton (909 kg.); this high figure is due to the heat of fusion of Al. The principal expense in the crucible process lies in the crucibles and in the elec. furnace. The expense is due to high installation and current costs. The latter costs are not increasing as rapidly as fuel costs and melt losses are about $\frac{1}{4}$ those of the crucible process. Other advantages of the elec. furnace include: absence of fume and smoke; little lining repair, lower heat radiation and better working conditions. *Heats of fusion* in B. t. u. are given as: Al, 139; Zn, 58; Sn, 25. W. H. BOYNTON

Electrothermic zinc developments. T. M. BAINS, JR. *Chem. Met. Eng.* 26, 894-5(1922).—Further work on Zn condensation (cf. C. A. 14, 496) has resulted in the following improvements. (1) Use of one size of briquet, for both cross-connections and columns, of square or rectangular cross-section. (2) Twelve column set-up of briquets for single delta, double Y and double delta operation. (3) Electrodes entering top instead of bottom of the furnaces. (4) Use of standard elec. equipment. (5) Use of refrax, carborundum brick for heating of condenser. These different points are briefly described. W. E. RUDER

Metallic sodium, a critical review of the development of the metallic sodium industry. H. E. BATSFORD. *Chem. Met. Eng.* 26, 888-94, 932-5(1922).—The first article deals with the electrolytic processes which have been used or proposed beginning with Matthiessen in 1855 and including Hopfner, Grabau, Castner, Carrier, Darling and Seward and VonKugelgen of the earlier days and Brodie, McNitt, Smith and Veasey and others from 1916 to 1920. The work of LeBlanc and Bergman on the action of fused NaOH on metals is reported as is also the study of the reactions taking place during the electrolysis. The second article has to do with the chemical processes which have been proposed. It begins with Thompson who, in 1879, caused NaOH to react with molten iron, and ends with Freeman in 1919, who treats NaCl with CaC₂. While the author has had some experience in the reduction of Na the text has been drawn largely from the patent reports. A comprehensive bibliography arranged chronologically from 1855 to 1920 is appended. L. D. VORCE

Cathodic deposition of tellurium and selenium from their oxygen acids and their

electro analytical determination. E. MÖLLER. *Z. physik. Chem.* 100, 340-40 (1922).—Te has been deposited on a Pt cathode from an electrolyte consisting of 2N H_2SO_4 + 1.1 g. Hg_2TeO_4 per l. with a cathode potential between -0.09 and -0.100 v. measured against a normal calomel electrode. Attempts to deposit Te from a soln. of H_2SO_4 and H_2TeO_4 have not been successful. Very small red deposits of Se have been obtained on Pt cathodes from an electrolyte consisting of 2N H_2SO_4 + 1.3 g. H_2SeO_4 per l. with a potential between -0.048 and -0.207 v. No deposits were obtained from solns. of H_2SO_4 and Na_2SeO_4 . By short-circuiting the electrode through a Pb accumulator, H_2TeO_4 has been quantitatively sepd. from H_2TeO_4 in 2N H_2SO_4 soln. The electrolyte was kept at 20° and stirred at the rate of 800 r. p. m., and concentric Pt gauze electrodes were employed. (The current-strength is not given.) Se has been deposited quantitatively from an electrolyte contg. 0.2133 g. Cu + 0.0406 g. Se in 150 cc. 2N H_2SO_4 , with a current of 750-970 milliamp. at 2 v. and 29° . The Cu and Se are deposited together and the wt. of the latter is obtained by subtracting the wt. of the former from the total wt. of metal deposited on the cathode. It has not been possible to carry out a sepn. of Se and Te.

H. JERMAIN CREIGHTON.

Studies on the electrodeposition of lead from Mather's perchlorate bath. I. The structure of the deposit. W. E. HUGHES. *J. Phys. Chem.* 26, 316-23 (1922); cf. C. A. 16, 386.—The 2-fold structure of Pb deposits from the perchlorate bath is described and illustrated with micrographs. Deductions are given which are based upon observations during disclosure of structure by electrolytic etching and upon a study of the structure itself. Upon etching a skin comes off which is probably within the deposit. Addn. of a colloid apparently prevents the deposition of loosely adherent crystals.

W. H. BOYNTON.

How the life and performance of the lead storage battery may be extended by proper care. M. F. PACKARD. *Coal Age* 21, 733-4 (1922).—The surface should be protected by an acid-resisting paint, and corrosion of terminals retarded by the use of grease. The electrolyte should have a sp. gr. of 1.27-1.28 at 21° with a correction of 0.001 for each 1.7° above or below this temp. Local cell trouble is detected when giving an equalizing charge or by refusal to gas after long overcharge. An amp.-hr. meter is a reliable guide to the state of the battery charge, provided the accumulator is periodically given equalizing charges.

W. H. BOYNTON.

Keeping nickel-iron storage batteries in condition. M. F. PACKARD. *Coal Age* 21, 779-80 (1922).—These batteries have an alk. electrolyte and exclusion of foreign matter is important. To prevent crystn. and to make cleaning easier the tops of the cells should be covered with an oil. Alkali-proof paint should be applied to cells and trays and water which is lost rapidly should be replaced every 2-3 days, but never during charging. Other precautions are given and KOH is claimed to be better than NaOH. Batteries should not be discharged at over 6 times the normal rate and best results are obtained at $1\frac{1}{4}$ times. An amp.-hr. meter is desirable. The sp. gr. of the electrolyte is 1.25 and it falls to 1.18, owing to retained electrolyte by the electrodes. W. H. B.

Electrolytic preparation of o-aminophenol. O. W. BROWN AND J. C. WARNER. *Trans. Am. Electrochem. Soc.* 41, (preprint Apr. 1922).—Tabulated results of expts. are given which show the effect of c. d., concn. of NaOH and o-nitrophenol in the cathode liquor, and temp. at different c. d.s. on current efficiency and material yield. The quantity of amine produced was detd. by a method involving diazotization with standard NaNO_2 .

C. C. VAN VOORHIS.

Mineral sulfides as a source of electrical energy. G. N. LIBBY. *Eng. Mining J.-Press* 113, 678-9 (1922).—L. shows that mineral sulfides may be a source of elec. energy of com. value and strives to stimulate interest in the solution of this chemico-mechanical problem. The expts. were made in a 300 cc. beaker inside of which a 200

cc. beaker contg. $1\frac{1}{4}$ " of Hg rested. The Hg was covered with a $\frac{1}{4}$ " layer of CHCl_3 . A small piece of pyrite (1" cube) made contact to the Hg and a strong soln. of alkali is added nearly to fill the beaker. Strong HNO_3 was placed in the outer beaker and the 2 solns. were connected by $30\frac{1}{4}$ " asbestos wicks. The Cu wire was protected by a glass tube and inserted into Hg gave an elec. connection to the pyrite. The cell consisted of Pt, HNO_3 , a diaphragm, NaOH and pyrite, with Hg almost completely insulated. The cell gave 1.15 v. and 0.3 amp. without diminution until the $\text{Fe}(\text{OH})_2$ formed was sufficient to increase the resistance. Addn. of K tartrate keeps the Fe. in soln. Reaction at the cathode is established while at the anode the sulfide is first oxidized and then reacts with alkali to form $\text{Fe}(\text{OH})_2$. Consequently alkali and sulfide are both consumed. $\text{Ca}(\text{OH})_2$ is used to replenish it. The cell developed is not adaptable to large scale work but certain mineral sulfides are possible sources of elec. energy. Pyrite is a notable example on account of it being oxidized metalurgically in enormous quantities with results often wasted. The prominent fact developed is that certain mineral sulfides readily oxidize as an anode in alk. soln.

W. H. BOYNTON

A neglected electromagnetic force (HERING) 2. Determination of the density of transformer oils (STIEGL) 7. Electroosmosis (BARY) 2. A study of carburization in the manufacture of synthetic cast iron (WILLIAMS, SIMS) 9.

ENGELHARDT, VIKTOR: The Electrolysis of Water. Easton, Pa.: Chemical Publishing Co. 140 pp. \$1.50.

LEBLANC, MAX: The Production of Chromium and its Compounds by the Aid of the Electric Current. Easton, Pa.: Chemical Publishing Co. 122 pp. \$1.50.

NISENSEN, H.: The Arrangement of Electrolytic Laboratories. Easton, Pa.: Chemical Publishing Co. 81 pp. \$1.50.

PFAUHAUSER, W.: Production of Metallic Objects Electrolytically. Easton, Pa.: Chemical Publishing Co. 162 pp. \$1.50.

Electric furnaces. O. A. COLBY. U. S. 1,412,511-12, Apr. 11.

Electric furnace. A. WESTERBERG. U. S. 1,412,764, Apr. 11.

Electric furnace. F. W. MOFFAT. U. S. 1,413,678, Apr. 25.

Electric furnace. A. JONAS. U. S. 1,414,362, May 2. The electrodes are rotated so as to maintain the form of their points.

Electric furnace for special alloys. SEIJI IKEDA. Jap. 39,150, July 5, 1921. The furnace is made of 2 closed, separately heated chambers connected by a wall having a communicating tube. Metals or non-metals in the 2nd chamber are introduced into a melted metal in the 1st chamber in melted or vaporized state for making alloys.

Electric heat-treatment of iron and steel. W. M. MORDEY. U. S. 1,412,484, Apr. 11.

Metallic carbides. S. GOLDSTEIN. Brit. 175,638, Feb. 16, 1922. Artificial stones for making drilling and turning tools and wire-drawing dies are produced by mixing powd. W, Mo, or like difficultly fusible metal with diamond dust, and heating the mixt. in a closed mold in an elec. arc or resistance furnace. The product is a carbide which may contain excess C in the form of diamond particles, particularly in the center of the mass. Other metals such as Fe and Ti may be added to the mixt. before heating.

Artificial corundum. H. A. RICHMOND and R. MACDONALD, JR. U. S. 1,413,785, Apr. 25. Impure Al_2O_3 is melted, a portion of the Si and Fe oxides is reduced by C in an elec. furnace (without materially reducing the Ti oxide which is present to not more than 0.6%) and the mass is allowed to cool.

Electrolytic iron. F. A. EUSTIS, C. R. HAYWARD, H. M. SCHLICKER and D. BELCHER. U. S. 1,412,174, Apr. 11. In the electrolysis of a neutralized soln. containing ferrous and ferric Fe, action of the ferric Fe in soln. on the cathode deposit is prevented by use of Fe sulfide as a reducing agent.

Water electrolysis. J. HARRIS and J. R. ROSS. Brit. 175,672, Sept. 18, 1920. A cell for generating O and H comprises a pair of anodes and a pair of cathodes, each having V-shaped vertical ribs making line contact with the diaphragms. A suitable construction is specified.

Electrolysis of brine. G. HARRISON. Brit. 175,401, Nov. 15, 1920. A battery for the electrolysis of brine is built up of units, each comprising an insulating partition surrounded by a frame which may be integral with or sep. from the partition or may consist of 2 members arranged on either side of the partition. An iron or other metallic screen constituting the cathode is inset into the edge of the frame and is provided with angle bars by means of which it is secured to carbon blocks projecting through the partition. A suitable construction is specified.

Electrodeposition of lead and tin mixture. J. S. GROFF. Brit. 175,456, Dec. 1, 1920. Metals are coated electrolytically with a mixt. of Pb and Sn in substantially equal parts. The coating is elastic and is particularly applicable to articles subject to variations in temp. and pressure. Anodes consisting of a mixt. of Sn and Pb in equal parts are prepd. by casting, and are immersed in Pb fluoborate soln.; a current is then passed with a temporary cathode of steel until the proportions of Sn and Pb in the electrolyte are substantially equal. The electrolyte is preferably prepd. in the following way: 90 lbs. of boric acid are dissolved in 204 lb. of HF and 120 lbs. of white lead made into a thin paste with H₂O are then added. The whole is made up to 120 gal. with H₂O and 6 oz. of glue dissolved in a little warm H₂O is then added. The electrolysis is carried out in a pitch-lined tank.

Electrolytic apparatus for deposition of metals. C. LANGER. U. S. 1,414,423, May 2. The app. is adapted for sepn. of Cu and Ni and comprises a cathode of perforated metal packed with loose pieces of metal. Cf. C. A. 16, 688.

Suspension device and current regulator for use in electrodeposition of metals. E. VOIGT. U. S. 1,412,909, Apr. 18.

Electrolyte for electrolytic condensers. J. COULSON. U. S. 1,412,513, Apr. 11. A 1-2% soln. of (NH₄)₂CO₃ is used in condensers, lightning arresters, rectifiers or similar devices. U. S. 1,412,514 specifies a dil. soln. of ammonium malate or malic acid and ammonium borate. Cf. C. A. 16, 208.

Mercury-vapor rectifiers. BROWN, BOVERI, AND CO. Brit. 175,618, Feb. 7, 1922. An anode has a heating and a cooling device acting in opposition. The cooling may be maintained constant, and the heating increased as the current through the rectifier decreases, or decreased as the current increases, or the heating may be constant and the cooling varied in accordance with the current. In another arrangement, the heating and cooling devices are both regulated so that the anode temp. is kept constant independently of the current. The regulation may take place automatically according to any desired law, for instance, by means of current relays controlling the regulating mechanism of the heating and cooling devices.

Electric apparatus for precipitating suspended matter from gases. M. P. LAUGHLIN. U. S. 1,412,243, Apr. 11.

Electrical precipitation of suspended matter from gases. S. H. RHODES. U. S. 1,413,993, Apr. 25. C smoke is used to facilitate collection of fumes such as As fumes.

Separating dust and fumes from hot furnace gases. W. A. SCHMIDT. U. S. 1,413,877, Apr. 25. Scrubbing and elec. pptn. are successively used.

Storage battery. C. F. HIGH. U. S. 1,413,226, Apr. 18. Structural features.

- Storage battery.** R. H. GRANT. U. S. 1,414,510, May 2. Structural features.
- Storage battery.** W. ROBERTS. U. S. 1,414,710, May 2. Structural features.
- Liquid level indicator for storage batteries.** R. W. MILLARD and M. A. MICHAELS. U. S. 1,414,745, May 2.
- Manganese depolarizing material.** A. A. WELLS. U. S. 1,412,986, Apr. 18. Depolarizer material from old dry cell elec. batteries is purified for reuse by sepg. insol. Zn compds., e. g., by leaching with dil. acid.

5—PHOTOGRAPHY

LOUIS DERR

The present position of color photography. E. KÖNIG. *Z. angew. Chem.* 35, 203(1922).

E. J. C.

Optical and photographic properties of some isomeric isocyanines. F. M. HAMER. *Phot. J.* 62, 8-14(1922).—Three groups of these were prep'd., each contg. 5 isomerides, the cinnamylamino, acetylamino, and amino derivs. of 1,1'-dimethylisocyanine, hydriodide. The influence of a given substituent may vary widely with its position in the molecule. Many spectrograms are given, for which the original paper must be consulted. Cf. *C. A.* 15, 4008.

L. DERR

Action of soluble iodides and cyanides on the photographic emulsion. S. E. SHEPPARD. *Phot. J.* 62, 88-97(1922).—The existence of a red-sensitizing effect of dil. KI and KCN solns. is confirmed, and shown to be specific to the emulsion. A direct fogging effect of iodides has been confirmed. The mechanism of red-sensitizing is discussed, and it is suggested that the orienting effect of the I in the Ag halide crystal lattice is responsible, rather than the mechanical rearrangement of colloid Ag nuclei.

L. DERR

Potassium persulfate as a reducer. G. I. HIGSON. *Phot. J.* 62, 98-109(1922).—A pure soln. gives slightly supraproportional reduction, well suited for reducing over-developed plates. Additions have substantially the same effect as for the $(\text{NH}_4)_2\text{S}_2\text{O}_8$ reducer. Metallic and H ions accelerate the reduction, Cl ions retard it. The catalytic theory is modified, and the velocity of reduction of $\text{K}_2\text{S}_2\text{O}_8$ is shown to be in accordance with theory. Collodion negatives reduce in substantially the same way as gelatin plates.

L. DERR

Sepia toning with colloidal sulfur. S. O. RAWLING. *Phot. J.* 62, 3-5(1922).—Apparently the only way of producing colloidal S is to pour 7 cc. satd. soln. of S in boiling alc. into 700 cc. water with stirring. The milky liquid resulting is free from H_2S , but carries not more than 0.05 g. S per l. Bromide prints tone in this soln. in 3-8 hrs. In 3-4 weeks the S ppts. out of the soln. and no toning is possible. As no H_2S can be detected at any time, there appears to be no doubt that colloidal S will of itself tone bromide prints.

L. DERR

The wet collodion formula of Scott Archer and Hardwick revized. W. T. WILKINSON. *Phot. J.* 62, 5-7(1922).—All bath troubles are eliminated, and the process is made simple and certain as follows: Dissolve 16 g. NH_4Br and 6 g. CaCl_2 in 240 cc. "industrial spirit," filter, add 360 cc. methylated ether (0.725) and add to 1800 g. Johnson's or Parsons' plain collodion; allow 2 weeks ripening. Sensitize in 12% AgNO_3 soln. Plates thus coated and sensitized may be manipulated like the usual wet-collodion plates; or, by washing out the free AgNO_3 and exposing while wet, development may be done with any alk. developer. If the washed plate is coated with an organicifier, such as tannin or any of the old preservatives, and dried, it may be made color-sensitive by dyeing.

L. DERR

Fluorescent screens. BRITISH THOMSON-HOUSTON CO., LTD. Brit. 175,428, Nov. 10, 1920. Fluorescent screens having a relatively hard and washable surface are prepd. by mixing a fluorescent substance with a binding material at an elevated temp. and bringing the resultant mixt. into contact with a smooth surface. A method is described in which a powd. fluorescent substance such as Ca tungstate is wetted with acetone or other solvent of celluloid and is then added to a soln. of celluloid or other cellulose compd. at a temp. of about 45°. The hot mixt. is poured upon a mold, preferably at the same temp., having a polished surface, and after evapn. of the solvent the resultant screen is removed.

Photography. P. SCHROTT. Brit. 175,988, Feb. 23, 1922. To transform a silver image into a tanned gelatin image by hardening the gelatin in the presence of the image by a dichromate, the silver image is first treated in a bath, such as Cu bromide or chloride or silver ferrocyanide, to obtain a compd. metal image which acts as a reducing agent to a dichromate, and the image is then treated in the dichromate bath. A yellow image is formed which is an indication that the tanning is complete. The metal image can be dissolved out by acid, leaving a clear tanned gelatin image which can then be colored by dyes, or a greasy printing coloring matter can be used and the image used as a photo-type.

Color photography. J. F. SHEPHERD and COLOR PHOTOGRAPHY, LTD. Brit. 175,003, Oct. 30, 1920. Relates to the production of color prints consisting of subtractive component prints prepd. by 2 or more dissimilar methods. Two chemically toned images, such as toned bromide prints, are combined with a pigment or dye image or print. A magenta carbon print together with bromide prints toned to blue-green and yellow, resp., is instanced. The color tone of the magenta image may be modified by a soln. of flavazine or naphthol yellow or a combination of these. The dye image may be obtained from a gelatin or other printing surface. For the blue-green bromide print a toning-bath of ferricyanide, Fe citrate, and citric acid may be used, and for the yellow print a toning bath of HgI₂, KI, and ferricyanide. Transparencies or prints on paper may be obtained, and in the latter case one of the images which is opaque in character should be next to the paper or other backing. Cf. 1937, 1911 (C. A. 6, 1889) and 20,556, 1912 (C. A. 8, 875).

Color photography. F. M. WARNER. Brit. 175,373, Nov. 10, 1920. Positives from combined screen-plate negatives are produced by printing the screen-plate negative onto a support coated with a panchromatic emulsion and subsequently registering a viewing screen. The conditions under which the positive is printed must be balanced as regards light and emulsion with those under which the negative is taken, either by the use of compensating filters or by adjusting the color-sensitiveness of the emulsion. Cf. C. A. 15, 477.

Solution for photographic sensitizing. Y. A. F. SCHWARTZ. U. S. 1,414,309, Apr. 25; Brit. 175,317, Feb. 23, 1922. A soln. containing Ag phosphate and ferric oxalate or a similar compd. adapted to yield a compd. acting with Na oxalate as a developer on exposure to light is employed to sensitize paper, etc.

6—INORGANIC CHEMISTRY

H. I. SCHLESINGER

Thallous nitrite in some complex nitrites and double nitrites. V. CUTTICA AND A. PACIBELLO. *Gazz. chim. ital.* 52, I, 141-7(1922).—Among the metallic nitrites the alkali nitrites constitute one class and the heavy and noble metal nitrites a 2nd class, with the nitrites of the alk. earth metals as intermediate. Alkali nitrites unite with the others to form compds. of a higher order, of which there are 3 types: (a) perfect

complex nitrites; (b) imperfect complex nitrites; (c) double nitrites (cf. Werner, *Neuere Anorganische Chemie*, etc., 3rd. Ed. p. 131(1913)). While metallic Ti is closely allied in its phys. properties to the heavy metals, TiNO_2 behaves much like alkali nitrites (Rolla and Belladen, *C. A.* 14, 1498). In the compds. described here it plays the role of K, Cs and NH_4 in analogous salts. By allowing TiNO_2 (prepd. according to Vogel (*Z. anorg. Chem.* 35, 404(1903))) to act in excess on $\text{Cu}(\text{OAc})_2$ there is first a change in color from blue to green-yellow, indicating the formation of a new ion: the nitrite cupric complex ion. Evapn. over H_2SO_4 in *vacuo* gave thallous cupric nitrite (A), $\text{Ti}_4(\text{Cu}(\text{NO}_2)_2)_3$, as opaque black crystals. The solid salt and aq. solns. of A are stable at ordinary temps., while $\text{Cu}(\text{NO}_2)_2$ is highly unstable. In other Cu complexes Cu shows a max. coordination no. of 6. Thus in the triple nitrites, $\text{M}''\text{M}'_2(\text{Cu}(\text{NO}_2)_2)_3$, where M' is Ca, Ba, Sr, Pb and M'' is K, NH_4 , Ti (Prizbilla, *Z. anorg. Chem.* 15, 419(1897); 18, 449(1898)) Cu has the max. no. This difference is said to be due to the fact that the Ti deriv. is an imperfect complex. In order to follow the equil. among the products the changes of cond. of solns. contg. 0.1 N solns. of $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$ and $\text{Ba}(\text{NO}_2)_2 \cdot \text{H}_2\text{O}$ in various proportions were measured. The curve shows 2 inflexions due to 2 complexes having the ions $[\text{Cu}(\text{NO}_2)]$ and $(\text{Cu}(\text{NO}_2)_2)$, resp. The possibility of identifying these 2 stages is due to the slowness with which the equil. between the less complex ion with changes in the concn. of Cu with respect to NO_2 is established. The formation of the imperfect complex A is interpreted similarly. A freshly prepd. $\text{Ni}(\text{NO}_2)_2$ soln. with TiNO_2 gave a color change from green to green-yellow and the soln. in *vacuo* over H_2SO_4 sep'd. thallous nickel nitrite, $\text{Ti}_4(\text{Ni}(\text{NO}_2)_2)_3$, as meat-red crystals, which are stable in air and which give a green soln. in H_2O . Evapn. TiNO_2 and $\text{Ba}(\text{NO}_2)_2$ in aq. soln. at low heat sep'd. excess TiNO_2 first and then the double salt $2\text{Ba}(\text{NO}_2)_2 \cdot \text{TiNO}_2$ as gold-yellow crystals. The corresponding K salt is $\text{Ba}(\text{NO}_2)_2 \cdot 2\text{KNO}_2$. Solns. of $\text{Pb}(\text{NO}_2)_2$ and TiNO_2 on evapn. in *vacuo* over H_2SO_4 give the double salt $\text{Pb}(\text{NO}_2)_2 \cdot 2\text{TiNO}_2 \cdot \text{H}_2\text{O}$, which in hot H_2O is much more stable than $\text{Pb}(\text{NO}_2)_2$, but decomposes somewhat giving $\text{Pb}(\text{OH})_2$.

E. J. WITZEMANN

Complex chlorides containing gold. II. Cesium triple salts. H. L. WELLS. *Am. J. Sci.* 3, 315-26(1922); cf. *C. A.* 16, 1713.—The prepn. and analysis of five new salts are described: $\text{Cs}_4\text{Ag}_3\text{Au}_3\text{Cl}_{12}$, $\text{Cs}_4\text{ZnAu}_3\text{Cl}_{12}$, $\text{Cs}_4\text{HgAu}_3\text{Cl}_{12}$, $\text{Cs}_4\text{CuAu}_3\text{Cl}_{12}$, and $\text{Cs}_4\text{Au}_3\text{Au}_3\text{Cl}_{12}$. The first and fifth are black and opaque and form black powders; the second is yellow, the third orange and transparent, both forming yellow powders; the fourth is black and forms pale brown powder. The simplest formulas of the Ag and aurous salts are doubled since it is judged that they crystallize isomorphously, the Ag with the Zn salt and the aurous with the Hg salt, as crystals of their mixts. are uniformly black even when a large proportion of the yellow salt is present. It was found that CsHgCl_4 is isomorphous with $\text{CsHgAu}_2\text{Cl}_{12}$ and $\text{CsAu}_2\text{Au}_2\text{Cl}_{12}$ so that the formula $\text{Cs}_4\text{Hg}_2\text{Cl}_{12}$ should perhaps be ascribed to the double salt. No Cs-Ca-auric salt could be prepd. In prepg. these new salts a large excess of CsCl is desirable but the solns. should be very dil. with respect to Au to avoid deposition of CsAuCl_4 . Much HCl , even to full strength, favors formation of the crystals. A. R. M.

Melting point of neutral ammonium sulfate. R. KATTWINKEL. *Ber.* 55B, 874 (1922); cf. *C. A.* 14, 2306.—Since $(\text{NH}_4)_2\text{SO}_4$ decomposes with rising temp. with liberation of NH_3 , one cannot properly speak of its m. p. H. JERMAIN CREIGHTON

New observations with copper sulfide. W. GLUUD. *Ber.* 55B, 952-3(1922).—The oxidation of CuS or Cu_2S to CuSO_4 and thiosulfate by air at room temp. is markedly accelerated if the oxidation is carried out in NH_4OH suspensions of the sulfide. In neutral or acid soln. oxidation takes place with much more difficulty, it being necessary to employ air under pressure and a temp. of 160° . In one of the 4 expts. described, a current of air was blown through a suspension of CuS in NH_4OH contained in a tube

filled with glass beads. After 2-3 hrs. the CuS had disappeared and the liquid was deep blue in color.

H. J. JERMAIN-CHARRON

The aluminates of sodium. Equilibria in the system $\text{Na}_2\text{O}-\text{Al}_2\text{O}_3-\text{H}_2\text{O}$. F. GOUDRIAAN. *Rec. trav. chim.* 41, 82-95(1922).—See C. A. 15, 478.

E. J. W.

Preparation of certain ferrioxalates. G. J. BURROWS AND E. E. TURNER. *J. Proc. Roy. Soc. N. S. Wales* 55, 263-5(1922).—The sparingly sol. Ba salt was obtained by heating in aq. soln. $\text{Fe}_2(\text{SO}_4)_3$, Ba(OH)₂ and $\text{H}_2\text{C}_2\text{O}_4$ and extg. with boiling water. Analysis indicated $\text{Ba}_2[\text{Fe}(\text{C}_2\text{O}_4)_3]_3 \cdot 12\text{H}_2\text{O}$. By using the NH_4 alum, the same Ba salt was obtained and by spontaneous evapn. of the filtrate from it $\text{NH}_4\text{Ba}[\text{Fe}(\text{C}_2\text{O}_4)_3] \cdot 3\text{H}_2\text{O}$, bright green prisms, intermediate in soly. between the Ba and NH_4 salts. From the Ba salt and the appropriate sulfate were obtained the $\text{K}(3\text{H}_2\text{O})$, $\text{NH}_4(3\text{H}_2\text{O})$ and $\text{Na}(5\text{H}_2\text{O})$ salts, all bright green and very sol. The solns. of all these salts are stable in the dark but even the dry salts are decompd. by bright light. From the Ba salt were also prepd. the *cinchonine* $(\text{C}_{21}\text{H}_{27}\text{ON}_3)_2\text{H}_2[\text{Fe}(\text{C}_2\text{O}_4)_3] \cdot 6\text{H}_2\text{O}$, obtained as a yellow-green gum, slightly sol. in b. water and crystg. on slow cooling and addns. of a little EtOH, and the *strychnine* salt $(\text{C}_{28}\text{H}_{33}\text{O}_7\text{N}_2)_2\text{H}_2[\text{Fe}(\text{C}_2\text{O}_4)_3] \cdot 12\text{H}_2\text{O}$. Both these salts can be recrystd. from aq. EtOH.

A. R. M.

Action of acids on ammonium molybdo-malate. E. DARMOIS. *Compt. rend.* 174, 1062-4(1922); cf. C. A. 15, 2831, 16, 1713.—The previously reported compds. $2\text{MoO}_3 \cdot \text{C}_6\text{H}_8\text{O}_4$ (dextrorotatory) and $\text{MoO}_3 \cdot 2\text{C}_6\text{H}_8\text{O}_4$ (levo-rotatory) both form well defined NH_4 salts; that of the former is very active: $[\alpha]_D^{25} = +23^\circ$. Bases convert it finally to a mixt. of the neutral single salts. It is also very sensitive to the action of acids which cause a rapid decrease of rotation to a limiting value which corresponds to formation of an acid-resistant compd., almost certainly $\text{MoO}_3 \cdot 2\text{C}_6\text{H}_8\text{O}_4$. Expts. with various acids show that the diminution of rotation depends only on the concn. of H^+ ion. The method may be used to detect mineral acids in org. acid, e. g., H_2SO_4 in vinegar.

A. R. MIDDLETON

Preparation of gaseous metal hydrides from alloys and solutions. FRITZ PANETZ, ADOLF JOHANNSEN AND MAX MATTHIES. *Ber.* 55, 769-75(1922); cf. C. A. 14, 1494; 15, 213.—Attempts to increase the yields of the hydrides by an extensive study of the conditions most favorable for formation of active Mg alloys led to little result. When a mixt. of unaltered Mg and small pellets of Bi gave an unusually good yield of hydride, it was suspected that alloy formation was not essential. The hydride of Th C was obtained by using Zn instead of Mg, although Zn and Bi form no compds., while the well defined compds. Na_3Bi and Na_3Sn gave no trace of hydride. When Mg powder was thrown into solns. of Th C + Th B and of Po, formation of the hydrides could be detected. Methods and app. were then devised by which the hydrides of the non-radioactive metals were similarly obtained, best in the case of SnH_4 from H_2SO_4 solns. of SnSO_4 for which full details are given. The method gives good yields with regularity and is suited for lecture demonstration. The method has not given positive results with Pb as yet.

A. R. M.

Preparation of gaseous metal hydrides by the silent discharge. FRITZ PANETZ, M. MATTHIES AND E. SCHMIDT-HEBBEL. *Ber.* 55, 775-89(1922); cf. C. A. 15, 350.—Active H could not be made to combine when passed over powd. Bi. Upon using electrodes of Bi in the discharge tubes (Plicker) traces of BiH_3 not retained by a thick filter of wadding could be detected. Pb electrodes gave somewhat better results but with neither could weighable mirrors be obtained. Many expts. were then made to increase the yield, finely divided metal and widely varied forms of app. being used, but with little result. When expts. with the most carefully purified metal and H in an app. entirely without lubricant or rubber connection gave practically no hydride, it was concluded that the earlier results were due to catalytic action of some impurity, as had

been found for active N. Introduction of some illuminating gas into the H at once increased the mirrors and it was found that vapors of EtOH, Et₂O, glycerol, petroleum ether, paraffin oil or paper, and warm rubber were equally effective. None of the inorganic catalysts found efficient by Strutt had any marked action and it was concluded that these reactions are catalyzed by hydrocarbons. The most sparing use of CH₄ or of isoprene resulted in complicated mixts. from which the hydrides could not be sepd. by fractionation with liquid air. A new form of discharge tube was devised as well as an app. for condensing separately any desired portion of the reaction products. Drawings of both are given. A method was worked out for analysis of the hydrides in presence of hydrocarbons by absorption of the H in Pd with simultaneous condensation of hydrocarbons by liquid air. Preliminary trials with Sb showed that the method gave reliable results and that hydride and not alkyl compds. of the metal were formed. Attempts to analyze the hydrides of Bi and Pb were unsuccessful. These heavier hydrides remain in the less volatile gas fraction which apparently consists in part of unsatd. hydrocarbons, which, at the higher temp. required for decompn. of the hydride in the Marsh tube, form CH₄. The hydride of tin could be analyzed and the data confirm the formula SnH_4 . H₂Te was obtained in good yield by the new method. That part which decompd. upon melting of the condensate yielded very pure H while that which decompd. only in the heated Marsh tube yielded a gas which was not absorbed by Pd or condensed by liquid air, as was found with Bi and Pb. As hydride and alkyl compds. could scarcely be found in the same fraction, the supposition is strengthened that in these cases CH₄ was formed by secondary reaction in the Marsh tube. By this new method gaseous compds. were obtained with Ge, As and Se but not with Al, Zn and Hg which form gaseous alkyl compds. As the metal mirrors are easily and quickly identified, the method constitutes a valuable means of identifying the elements which form gaseous hydrides, particularly when only small amts. are available. A small piece of argyrodite gave within a few min. the characteristically colored mirror of Ge. A. R. M.

Nitrosyl selenic acid. JULIUS MEYER AND W. WAGNER. *J. Am. Chem. Soc.* 44, 1032-3 (1922).—Liquid N₂O₄ in great excess is poured into 100% H₂SeO₄·H₂O (C. A. 15, 2397). The excess of N₂O₄ is removed by vigorous stirring and the last traces in a vacuum desiccator at as low temp. as possible. The white crystals can be preserved in dry sealed tubes but decompose when warmed or exposed to moisture. They are sol. in concd. H₂SO₄ and H₂SeO₄ in abs. EtOH but not in Et₂O; m. at 80° with decompn. A. R. M.

Interaction of methyl iodide and potassium plumbite. J. G. F. DRUCE. *Chem. News* 124, 215-6 (1922).—Methyl plumbous acid is not formed as expected from the formation of methyl stannous acid. Hydrolysis of MeI to MeOH is followed by pptn. of PbI₂. A. R. MIDDLETON

Normal chromium azide and the formation of complex salts. E. OLIVIERI-MANDALA AND G. COMELLA. *Gazz. chim. ital.* 52, I, 112-5 (1922).—Complex salts of HN₃ are unknown. Double salts such as CoN₃·KN₃ and NiN₃·KN₃ and a mixed azide TiN₃·TiN₃ which Werner considered to be [(N₃)₂TiN₃]₂TI, are known. In previous expts. (cf. C. A. 14, 701) CrN₃·3C₂H₅N (A) was obtained. A, which is considered to be a complex salt [Cr(N₃)₂(C₂H₅N)₂], is best prepd. thus: Cryst. Cr(NO₃)₃ is dissolved in abs. EtOH and digested some days with anhyd. Na₂SO₄. The soln. is treated with some excess of NaN₃, the NaNO₃ formed is filtered off, the emerald-green soln. is treated with excess C₂H₅N and the soln. is concd. *in vacuo*. A does not give a ppt. with NH₄OH but does so with AgNO₃ after some time. Normal chromium azide, Cr(N₃)₃, was obtained by evaporating the above soln. without C₂H₅N *in vacuo* over KOH as a dark green hygroscopic mass. If the EtOH soln. is not dry basic azides Cr(N₃)₂OH and CrN₃·(OH)₂ are obtained. The same compd. was obtained in soln. from freshly prepd.

Cr(OH)₃ in a concd. aq. soln. of HN₃. On adding 3 mols. of NaN₃ in EtOH, CrN₃·3NaN₃ (B) sepd. as green crystals. Aq. solns. of B do not react for Cr or N₃ and with AgNO₃ give an explosive complex salt. B is probably the Na salt of chromylhydrazic acid, H₂Cr(N₃)₂, analogous to K₂Cr(CN)₆, K₂Cr(SCN)₆, etc. The free acid was not isolated because of its ease of decompn. Attempts to obtain it by the methods used by Wöhler and Martin (cf. C. A. 11, 2900) failed. E. J. WITZMANN

Decomposition of NH₄NO₃ by heat (SAUNDERS) 24. Detection of the formation of complex salts in dilute solutions (SHIBATA, *et al.*) 3. Reactions at metal boundary surfaces (RUFF) 2.

7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

The use of colored glasses in place of liquids in colorimetric investigations. KRAS SONDÉN. *Arkiv Kemi, Mineral. Geol.* 8, No. 7, 10 pp. (1921).—Colored glass has been used previously in H₂O colorimetry (cf. *Standard Methods for the Examination of Water and Sewage*, Boston, 1920), but the necessary glass is difficult to obtain. An improved method is developed for coloring glass in the lab. with any shade of yellow or of blue. The Ag salts are removed from photographic plates by Na₂S₂O₃. The plates are then soaked in either (NH₄)₂SO₄·Fe₂(SO₄)₃ (acidified with citric acid) or in Pb(NO₃)₂ soln., with subsequent immersion in either K₃Fe(CN)₆ or in K₂Cr₂O₇ solns., resp. By proper diln., the blue or yellow can be pptd. on different plates to form a graduated series of tones. Satisfactory yellow tones can also be made with picric acid. By constructing a colorimeter of 2 tubes, in 1 of which is the sample and in the other distd. H₂O with colored plates beneath, direct color comparisons can be made. Applications to the detn. of marsh-H₂O and of H-ion concn. are given. Colors obtained by Nessler's reagent and Pt-Co soln. may also be expressed in terms of a graduated series of plates. Since this method was devised, a new instrument based on the same principle with colored glass has been developed (cf. Lovibond's Tintometer, made by The Tintometer, Ltd., Salisbury, England). C. C. DAVIS

A starch indicator solution. W. J. PAINTER. *Analyst* 47, 166-7 (1922).—A starch soln. prepd. by the following directions was found to be still useful as indicator after 8 months. Boil common household, rice starch and an equal wt. of Na₂CO₃ with the usual quantity of water. Cool and add concd. HCl until the liquid is acid to litmus. Add a little Zn and allow to stand 24 hrs. and then filter the neutral soln. Starch paste prepared according to the directions in the Brit. Pharmacopoeia did not keep 10 days. W. T. H.

Influence of ethyl alcohol on the color change of phenolphthalein. R. WIGGENDER. *Z. physik. Chem.* 100, 532-6 (1922).—A discussion of the changes in the ionization const. of the tautomeric forms of phenolphthalein which take place owing to the presence of alc., and their bearing on the color change of the indicator. On the basis of certain assumptions, it is shown that at the transition point in alc. soln. the H⁺ concn. is 9.10⁻¹⁴ and the OH⁻ concn. 2.10⁻⁴. The influence of the solvent on the behavior of an indicator can be expressed in a marked displacement of the transition point. H. JERMAIN CREIGHTON

Xylenol blue and its proposed use as a new and improved indicator in chemical and biochemical work. ABRAHAM COHEN. *Biochem. J.* 16, 31-4 (1922).—A new indicator, 1,4-dimethyl-5-hydroxybenzenesulphonaphthalein or xylenol blue, was prepd. having 2 ranges, p_H 1.2 (red) to 2.8 (yellow) and p_H 8.0 (yellow) to 9.6 (blue). This indicator can be used in place of thymol blue. "The fact that p-xylenol is easily

prepd. from diazotized *p*-xylydine and that only half as much xyleneol blue as thymol blue is required, should render its use eminently preferable." BENJAMIN HARROW

Studies on thallium compounds. I. Analytical. A. J. BERRY. *J. Chem. Soc.* 121, 394-9 (1922).—In work with Tl compds., a number of facts were established some in agreement and some in disagreement with work previously published by others. (1) The reaction used by Browning and Palmer (*C. A.* 3, 1735) whereby Tl^+ is oxidized to Tl_2O_3 by the action of $Fe(CN)_6^{4-}$ in alk. soln. is quant. The ppt. produced is pure Tl_2O_3 . (2) Tl_2O_3 is not reduced when it is dissolved in fairly concd. HCl although it is so stated in Abegg's *Handbuch*. (3) Pure $Tl_2(SO_4)_3$ is very difficult to prepare because it hydrolyzes so readily. The sulfate obtained by crystn. from dil. H_2SO_4 contained, as a rule, but little more than 1 SO_4 to 1 Tl. In only one case was it possible to obtain 2 SO_4 to 1 Tl. (4) In H_2SO_4 soln. it was impossible to det. Tl by titration of Tl^{4+} with $KMnO_4$, although an attempt was made to det. the end point electrometrically. In HCl soln. the results varied with different amts. of Tl present. In fairly concd. solns. good results were obtained if the rate of titration and vol. of HCl added were regulated carefully. (4) Reduction to Tl^{+} can be accomplished in alk. soln. by means of NH_4OH , in acid soln. by means of Fe^{2+} , and in nearly neutral soln. by means of NaH_2AsO_3 or by metallic Cu. W. T. H.

The determination of manganese by the Knorre method. NICOLARDOT, GELOSIO AND REGLADE. *Ann. chim. anal. chim. appl.* 4, 102-10 (1922); cf. *C. A.* 16 1719.—**Effect of acidity.**—In pptg. MnO_2 by persulfate the reaction proceeds satisfactorily if between 2.5 and 10% H_2SO_4 is present. Erratic values are obtained if the acidity is very low and with more than 10% acid the ppt. is not formed. **Effect of mass.**—In varying the Mn content from that equiv. to about 5 cc. of 0.1 N $KMnO_4$ to the equiv. of 132 cc. $KMnO_4$, the results varied only in accordance with the usual analytical error. **Effect of various cations.**—The presence of Zn, Mg, Cu and K ions does no harm but a slight error is caused by Ni and a serious error by Co. **Modified procedure.**—Of Fe-Mn take 0.2 to 0.5 g., of *spiegel* 0.5 g., and treat with 25 cc. of 7 N H_2SO_4 and a few drops of concd. HNO_3 . After the reaction is complete, evap. to fumes, cool, dil., and filter the hot soln. into a 800 cc. beaker. Dil. the filtrate to about 400 cc., add 10 g. of $(NH_4)_2S_2O_8$ and boil 15 min. with the beaker covered. Cool somewhat, add 5 g. more of persulfate and boil 5 min. Filter off the MnO_2 and wash with warm water. Transfer the ppt. back to the original beaker, add an excess of standard Fe^{2+} soln., 25 cc. of 7 N H_2SO_4 and, after the ppt. has all dissolved, titrate the excess Fe^{2+} with standard $KMnO_4$. In estg. the Mn content an empirical factor should be used and a correction made according to tables given in the original paper. W. T. H.

Determination of magnesium and alkalies in minerals. L. H. BORGSTRÖM. *Hyllningskrift tillagnad Ossian Aschan* 1920, 118-23. B. has tried various methods for the pptn. of $Mg(OH)_2$ and obtained the best results with piperidine. The results with the other reagents are in the following order: $NaOH$, $(CH_3)_4NOH$, $(C_2H_5)_4NOH$, $(CH_3)_3NH$ and NH_4OH . The results also show that $Mg(OH)_2$ should not be washed with hot, distd. water but with water to which a little pptg. reagent has been added. For the sepr. of Mg from alkalies in silicate analysis the most satisfactory method was found to be the J. Lawrence Smith method. C. E. CARLSON

Determination of krypton and of xenon in absolute values by spectrophotometry. C. MOURGUE AND A. LÉPAPE. *Compt. rend.* 174, 908-13 (1922).—The method previously described (*C. A.* 5, 1856; 6, 333) enables one to det. small quantities of these gases provided one knows in advance the ratios present in the atm. By prepg. artificial mixts. of Kr and of Xe with A it was found possible to det. the diln. limits which gave distinct lines for Kr λ 8670.91 and for Xe λ 4671.22. The Kr line was visible when 0.5 to 4.5% Kr was present in the gas and the Xe line when 2 to 8% Xe was present. With these

data, it is possible to det. the Kr and Xe content of any gas without reference to the atm. and the method of analysis is made more accurate and less complicated. W. T. H.

A rapid iodometric estimation of copper and iron in mixtures of their salts. I. W. WARK. *J. Chem. Soc.* 121, 358-63 (1922).—The method depends upon the fact that although FePO_4 in the presence of AcOH does not liberate I_2 from KI , it does so in the presence of mineral acid. Cu, therefore, is detd. iodometrically after the addition of phosphate as in the method of Moser (*Z. anal. Chem.* 43, 597 (1904)). Mineral acid is then added to the titrated soln. and a second iodometric titration shows the Fe present. This method requires less time and material than that of Ley (*C. A.* 12, 1446) which depends upon the titration of Fe and Cu together and then of Cu alone in the presence of phosphate. The method is accurate when the Cu and Fe contents are approx. equal and gives fair results over a wide range. W. T. H.

Two rapid methods for the determination of the density of transformer oils. O. STRELS. *Rev. gén. élec.* 9, 915 (1921); *Science Abstracts* 24B, 394-5.—The first method is a particular application of the general method of d. detn. by flotation. Two mixts. of alc. and water are prepd., of which the densities are, resp., 0.85 and 0.92 at 15° , and these are poured into two test-glasses. With the aid of a pipet, or of a small glass tube, a sample of the oil to be tested is then taken, and a portion of it is allowed to flow out upon the surface of the 0.92 mixt. and another portion beneath the 0.85 mixt. If the d. of the oil lies between these two limits, the oil particles agglomerate and remain at the places indicated. If it be desired to det. the d. of the oil with greater accuracy, there is then added to the contents of the test-glass contg. the 0.85 mixt. a measured portion of a titrated water-alc. soln., until the oil, which lies at the bottom of the test-glass, rises and floats in the form of a sphere in the middle of the new alc. mixt. From the vol. of alc. soln. added the d. of the new mixt. is then calcd. The second method is a new one, and consists in taking a glass tube of about 10 mm. diam. and 1250 mm. in length, open at both ends, and graduated from a zero point about 80 mm. from its lower end, and in mm. from 850 up to 1000. This tube is filled by suction with the oil to be tested, as far as the point marked 920, which gives a column 1000 mm. in height; the smaller tube is then immersed in a larger tube, closed at its lower end, and contg. distd. water at 15° . By manipulation of the narrower tube the lower end of the oil column in this tube is made to coincide with the zero mark of the graduation, and by reading off in mm. the height of the column of water which is now balancing the 1000 mm. of oil, the d. of the oil is obtained. H. G.

The volumetric determination of titanium dioxide in bauxite. H. J. WINCH AND V. L. CHAND-RATREYA. *Chem. News* 124, 231-2 (1922).—Fuse 0.3 g. of the sample with 3 g. KHSO_4 , dissolve the melt in hot dil. HCl and reduce the Fe^{+++} to Fe^{++} and the Ti^{++++} to Ti^{+++} by treatment with 0.15 g. of powdered Sn. Add an excess of HgCl_2 to remove the excess Sn and titrate $\text{Fe} + \text{Ti}$ with standard $\text{K}_2\text{Cr}_2\text{O}_7$ soln. With another sample carry out the same procedure but in place of metallic Sn use SnCl_2 soln. as reducer, stopping as soon as the yellow FeCl_3 is reduced, thus detg. Fe alone. W. T. H.

Volumetric estimation of alkali pyrophosphates. FRANZ LUTZ. *Magyar. Chem. Folyóirat*, 25, 96-8 (1919).—In the estn. of pyrophosphates sol. in water, add a known excess of 0.1 N AgNO_3 . After making up to a certain vol., remove the ppt. of Ag pyrophosphate by filtration and titrate the Ag remaining in the filtrate with NH_4CNS soln., with iron alum as indicator. It was found that the greater the diln. after the pptn. of the Ag pyrophosphate the better were the results obtained, owing to the diassoc. of double salts formed in more concd. solns. A's Ag pyrophosphate is sol. even in a 1% soln. of Na pyrophosphate; the soln. of the latter is added in small quantities to the excess of AgNO_3 soln. with constant shaking. Any acidity must be carefully neu-

treated by addition of 0.1 *N* NaOH after pptn., since Ag pyrophosphate is sol. in the weakest acids. J. C. S.

Colorimetric estimation of phosphoric acid. ACH. GRÉGOIRE. *Bull. soc. chim. Belg.* 29, 253-8 (1920).—Treat 45 cc. of a soln. contg. from 0.002 to 0.025 mg. of P_2O_5 and 2 cc. of HNO_3 (d. 1.12) with 2 cc. of molybdic acid-quinine reagent, then dil. to 50 cc., and compare the coloration obtained with that of a standard mixt. prepd. under the same conditions. Small quantities of silica do not interfere, but Fe should be removed previously by means of the "cupferron" reagent. Prep. the quinine reagent by dissolving 1 g. of quinine sulfate in dil. HNO_3 , add a quantity of $Ba(OH)_2$ sufficient to ppt. the H_2SO_4 , filter the mixt., and add the filtrate to a soln. of 40 g. of NH_4 molybdate in 500 cc. of HNO_3 (d. 1.20); then dil. the whole mixt. to 1 l. J. C. S.

The determination of free acid in aluminium sulfate solutions. H. ZSCHOKKE AND L. HAUSELMANN. *Chem.-Ztg.* 46, 302 (1922).—By adding $BaCl_2$, $K_4Fe(CN)_6$, and gelatin to an aq. alum soln., the Al is pptd. and, after filtration the free acid can be detd. by direct titration with NaOH. Into a 100 cc. calibrated flask, introduce 10 cc. of the alum soln., 10 cc. of 10% $BaCl_2$ soln., 5 cc. of 10% $K_4Fe(CN)_6$ soln. which is not over 6 days old and 60 cc. of boiling water. While shaking, add warm, 2% gelatin soln. (1 to 1.5 cc.) until the Al ppt. is flocculent and settles well. Dilute to exactly 100 cc., filter, and take 50 cc. of the filtrate for titration with 0.1 *N* NaOH, using methyl orange as indicator. The gelatin soln. can be preserved by adding a little nitrobenzene and is suitable as long as it is a jelly in the cold. W. T. H.

The determination of nitrogen in nitric acid esters. H. KESSELER, R. RÖHM AND G. LUTZ. *Z. angew. Chem.* 35, 145 (1922).—In substances such as *nitro-starch*, the N content may be detd. by sapon. and reduction in an alk. soln., distg. off the NH_3 and catching the distillate in a known quantity of acid. To 0.25 g. of substance in a 50 cc. beaker, add a few drops of alc. and 5 cc. of warm, 50% KOH soln. If the alkali is too hot the reaction may become too violent. Allow the mixt. to stand a few hrs. until the substance has dissolved; hereby KNO_2 and KNO_3 are formed. Transfer the soln. to a 500 cc. round-bottomed flask, add about 500 cc. of water, 50 cc. of 33% KOH soln. and 1.5 g. of powd. Devarda's alloy. Heat gently to start the reduction, stopping when the evolution of H_2 begins. After about 90 min. the reduction will be complete. Distill off the NH_3 , catching the distillate in a measured vol. of 0.1 *N* H_2SO_4 and finally titrating the excess acid with standard NaOH soln. using methyl red as indicator. The procedure has been tested with nitrocellulose, nitroglycerin, nitroglycol and ethyl nitrate. In some case the initial sapon. requires 30 min. on the water bath. W. T. H.

Determination of fatty acids on the basis of their volatility with steam. W. ARNOLD. *Z. Nahr. Genussm.* 42, 345-72 (1921); cf. *C. A.* 3, 843.—Detailed methods are described for the sepp. of the formic acid series of fatty acids (from butyric to stearic) by steam distn. A 1-g. sample of the mixed acids is repeatedly distd. in a Polenske app. Sol. and insol. volatile acids are detd. in each successive distillate. Formulas are given from which the proportion of each acid may be calcd. D. B. DILL

The determination of sulfur in iron, steel and cast iron. H. TER MEULEN. *Rec. trav. chim.* 41, 121-3 (1922).—The S in these products is generally detd. industrially by dissolving the metal in HCl and passing the gas evolved through $Cd(OAc)_2$ soln.; the CdS is detd. iodometrically. This method is said (Kinder, *C. A.* 2, 1668) to give better results if concd. HCl is used. M. examd. 20 specimens by the methods recommended but could not confirm all the results reported by K.'s committee. He concluded that concd. HCl ought only to be used for white cast Fe while for steel, Fe and cast Fe dil. HCl gave best results and in all cases the quartz or porcelain tube was superfluous. This method requires 10 g. of sample and a correspondingly long time to dissolve it. By using the colorimetric method described in the following abstract, 0.25 g.

sample and 15 mins. are required for the entire analysis. The specimen is dissolved in 40 cc. dil. HCl (1:3) in a small flask, under a reflux condenser connected to a wash bottle containing 25 cc. of dil. KOH (0.1 g. per l.). A current of H_2 is passed through the app. to hasten the soln. The dissolution of the metal requires 10 mins. and the K_2S in the KOH soln. is ready for direct colorimetric detn.

E. J. WITZEMANN

A new method for determining sulfur in organic compounds and in technical products: petroleum, coal, illuminating gas and rubber. H. TER MEULEN. *Res. trav. chim.* 41, 112-20(1922).—If the vapors of an org. compd. together with H_2 are

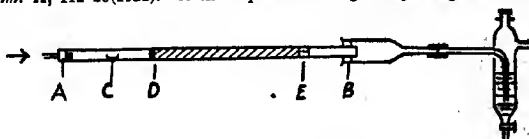


Fig. 1.

passed over platinized asbestos, all the S is obtained as H_2S ; this may be absorbed in alkali and detd. iodometrically or colorimetrically. Place about 0.02 g. of substance at C (Fig. 1) in the transparent quartz tube A-B, using an open boat for solids or semi-

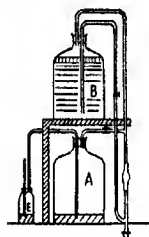


Fig. 2.

solids and a glass tube with small opening for liquids. Place a layer of platinized asbestos between D and E and have this hot before volatilizing or decomp. the substance but do not heat too rapidly or before the air is all swept out by H_2 . B is a paraffined cork and the receiver contains dil. alkali. For some substances, especially metallic org. compds., it is necessary to add a little borax to the residue and heat a second time to get all of the S. The analysis may be finished iodometrically as in the usual method for detg. S in steel, or colorimetrically as follows:—Place the unknown soln. in a buret and add it to 5 cc. of dil. Na_2PbO_2 soln. until the color of PbS matches that produced with a known amt. of standard Na_2S soln. which may be preserved in the app. shown in Fig. 2. B is a 4-l. bottle contg. 3.5 g. Na_2S in air-free water and covered with paraffin oil. A contains K pyrogallate. This Na_2S should be dild. 10-fold when used as a standard. In analyzing coal, use 10 mg. $Na_2B_4O_7$ as flux for 0.05 g. coal. With coke use a 10 mg. sample and 20 mg. $KNaCO_3$ as flux. With illuminating gas use about 1 l. of gas.

E. J. WITZEMANN

Sensitive test for phenols. JAMES MOIR. *Chem. News* 124, 245-6(1922).—See C. A. 16, 1551.

E. J. C.

The estimation of aldehydes and ketones by means of hydroxylamine. A. H. BENNETT AND F. K. DONOVAN. *Analyst* 47, 146-52(1922).—Further tests on the method proposed for the detn. of citral in lemon oil (Bennett, C. A. 3, 942) show that it may be applied to the analysis of various aldehydes and ketones. It is advisable to purify the $NH_4OH.HCl$ by recrystn. from water. In neutralizing to phenolphthalein, it is necessary to proceed very carefully, avoiding any local excess as well as hard stirring. Good results were obtained in the analysis of acetone, formaldehyde, benzaldehyde, cinnamaldehyde, carvone, citronellal and citral but with camphor no quant. results could be obtained. In work with citral, benzaldehyde, citronellal, etc., the reaction mixt. is boiled for 30 min. as recommended in the original method, but with formaldehyde and acetone the desired reaction takes place by allowing the mixt. to stand for 2 hrs. in a stoppered bottle.

W. T. H.

The comparative values of different specimens of iodine for use in chemical measure-

minerals (FOULK, MORRIS) 2. Carbon monoxide (GIRARD) 2. Determination of total nitrogen (MULLER, SAINT-RAT) 1. Cathodic deposition of tellurium and selenium and their electro-analytical determination (MÜLLER) 4. Action of acids on ammonium molybdate [detection of mineral acids in organic acid] (DARMOIS) 6.

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Detecting carbon monoxide with respirators. L. A. LEVY. U. S. 1,414,194, Apr. 25. See Brit. pat. 163,102 (C. A. 15, 3005).

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND WALTER F. HUNT

Synthetic silicate minerals. J. KOENIGSBERGER AND W. J. MÜLLER. *Neues Jahrb. Min. Geol. Beil.-Bd.* 44, 402-59(1921).—A repetition of results already published (C. A. 13, 3118) with remarks as to their bearing on natural occurrences in the drusy cavities of igneous rocks. J. C. S.

Diopside and planchite at Guchab, South West Africa. M. HENGLEIN. *Z. prakt. Geol.* 1921, 53-6.—Analysis of diopside gave: CaO 0.12, CuO 49.97, Fe₂O₃ 0.24, SiO₂ 37.38, H₂O 11.48, sum 99.69%. It occurs (1) in a breccia of quartz and dolomite, (2) in veins, 2-10 cm. wide, in dolomite, with calcite and quartz; (3) massive or drusy, in veins with quartz, malachite, and calcite in dolomite; (4) with malachite in rounded masses; (5) with planchite, malachite, calcite, and quartz in a limestone breccia, (6) crystd. in cavities in chalcocite.

EDW. F. HOLDEN

Collophane, a much neglected mineral. A. F. ROGERS. *Am. J. Sci.* 3, 269-76 (1922).—Collophane is amorphous Ca "carbophosphate," usually massive, sometimes oolitic, sp. gr. 2.6 to 2.9, varying with its porosity and compn.; the hardness varies from 3 to 5, and n from 1.67 to 1.63. Collophane is the main constituent of phosphate rock. Analyses of 4 foreign specimens are recorded, also one from Crawford Mts., Utah, which gave: CaO 50.97, MgO 0.22, Fe₂O₃ + Al₂O₃ 0.76, Na₂O 2.00, K₂O 0.47, SiO₂ 0.30, P₂O₅ 36.35, CO₂ 1.72, F₂ 0.40, SO₃ 2.98, H₂O 1.05, insol. 1.82, sum 99.04%. The mineral may be regarded as a solid soln. of CaF₂, CaSO₄, CaCO₃ and CaO in Ca(PO₃)₂. Like most other amorphous minerals it is of colloidal origin and contains an indefinite amt. of water. Formula: $3Ca_2(PO_3)_2 \cdot nCa(CO_3, F_2, SO_3, O) \cdot (H_2O)_m$, where n is an indefinite number varying from 1 to 2. The carbonate radical usually predominates over the other minor constituents. L. W. RIGGS

Stasite, a new mineral, dimorphous of dewindtite, ALFRED SCHOEN, *Compt. rend.* 174, 875-7(1922).—The torbernite of Belgian Congo is often impregnated with other U minerals. Among them were found yellow microscopic crystals which gave the chem. reactions of dewindtite. (Cf. C. A. 16, 1722). Its sp. gr. was 5.03. An av. of 4 closely agreeing analyses gave: PbO 26.20, UO₃ 56.20, P₂O₅ 10.80, H₂O 8.24, CaO 0.30, insol. 0.50, sum 100.04%, corresponding to 4PbO.8UO₃.3P₂O₅, the same as for dewindtite. It differs from the latter in d., color, color of powder and crystal form (symmetry not yet established). Its radioactivity is a little less than that of dewindtite. The name *stasite* is proposed in honor of the chemist J. S. Stas. L. W. RIGGS

A tantalite and some columbites from Custer County, South Dakota. WM. P. HADDEN. *Am. J. Sci.* 3, 293-9(1922).—Analyses are recorded of 8 samples of tantalites, 7 being from Old Mike Mica Mine, 6 1/2 mi. from Custer City. The analyses are tabulated according to increase in sp. gr., which ranged from 6.854 to 7.975. A specimen about midway of the series gave: Ta₂O₅ 78.28, Cb₂O₅ 5.56, TiO₂ 1.33, SnO₂ 0.28, FeO 13.35, MnO 1.22, sum 100.62%; sp. gr. 7.468. In the 8 specimens the Ta₂O₅ ranged from 69.55 to 83.57 and the Cb₂O₅ inversely, from 8.83 to 1.97. Of the 6 columbites studied, 5 were from Custer and one from Pennington Co. The Cb₂O₅ ranged from 68.00 to 28.81 and the Ta₂O₅ inversely from 9.88 to 53.67, TiO₂ 0.53 to 1.63, SnO₂ (including WO₃) 0.88 to 0.38, FeO 5.45 to 13.32, MnO 14.79 to 4.31; sp. gr. 5.201 to 6.845. L. W. RIGGS

Meteoric irons from Alpine, Brewster County, Texas, and Signal Mt., Lower California, and a pallasite from Cold Bay, Alaska. GRO. P. MERRILL. *Proc. U. S. Nat. Museum* 61, 1-4(1922).—The specimen from Texas was from a mass said to weigh 2 tons. Analysis by J. E. Whitfield yielded: Si 0.015, S 0.012, P 0.328, Mn none, Ni 5.62, Co 0.430, Cu 0.016, Fe 93.600, C 0.008, sum 100.029%. It agrees most nearly with ataxite of the Saratit group. The specimen from Lower Cal. was from a mass weighing about 140 lbs. A 10 g. sample containing no visible troilite, C, or schreibersite segregations yielded: Si 0.004, S 0.002, P 0.040, Ni 7.86, Co 0.60, Cu 0.015, Fe 91.470; sum 99.992%. It appears to be a medium octahedrite. The Alaska specimen is classed with the Rôckiky group; on account of its advanced stage of oxidation no analysis was made. L. W. RIGGS

Ore deposits of the Sierrita Mts., Pima County, Arizona. F. L. RANSOME. U. S. Geol. Survey, *Bull.* 725-J, 407-28(1922).—Several claims in the Papago district are described. Metallization has not been strong and large deposits of ore probably do not exist. The Pima district has yielded an annual av. for more than 10 yrs. of about 2 million lbs. of Cu, 300,000 lbs. of Pb, 50,000 oz. of Ag, a little Au and some Zn, the last appearing to be abundant. The metallization on the east side of the Mts. is much more intense than on the west, particularly in Cu ores of the contact-metamorphic type. L. W. RIGGS

Bonanza ore of the Comstock Lode, Virginia City, Nevada. E. S. BASTIN. U. S. Geol. Survey, *Bull.* 735-C, 41-63(1922).—The results of a microscopic and lithologic study of the ores from near the surface to depths of 2900 ft. are described. At depths greater than 600 ft. the Ag is essentially all in primary minerals. Descending solns. of surface origin produced an increase in the Ag content of certain ores at less depths, yet even there part of the Ag is primary. Au, so far as observed, is primary in all ores. The hot ascending mine waters of the Comstock Lode are essentially Na₂SO₄ and CaSO₄ solns. The cool descending waters are more than 200 times as concd. as the ascending and contain: earths + strong acids 13.0, metals + strong acids 30.4, and free acids, mostly H₂SO₄, 56.0%. L. W. RIGGS

The metalliferous beds of the mines of Rosas, Begatrotta, and Sa Marchesa. EDOARDO SANNA. *Rass. min.* 56, 41-7(1922).—Following a discussion of the origin

and metallurgical treatment of the ores (Pb and Zn) (cf. C. A. 16, 1199) there is presented a detailed est. of the cost of exploitation. It is calcd. that at least 75,000 tons of ore are available.

C. C. DAVIS

Mining possibilities in Syria and Palestine. PAUL RANGE. *Z. prakt. Geol.* 1921, 118-5.—The principal resources are chromite, coal (Lebanon), phosphate (eastern Jordan district), salt, building stones, marble, gypsum, and S.

E. F. H.

The relationships of the "Kupferschiefer." F. BRYSCHLAG. *Z. prakt. Geol.* 1921, 1-8.—The Cu-formation of the Mansfeld region is a sedimentary rock rich in bituminous matter and pyrite, and containing no primary Cu or Ag. The Cu, present as chalcocopyrite, was derived by the reducing action of the bitumen and pyrite on solns. which ascended from a Permian magma. Most of the ore has undergone secondary enrichment. Ni-Co ores were formed as a first generation at higher temps.

E. F. H.

The iron laterite deposits of Dondebary, and the possibility of an iron smelting industry in Surinam. F. W. VORT. *Z. prakt. Geol.* 1922, 17-24.—The Dondebary deposit is a surface laterite, a typical oölitic ore, and was probably formed by the weathering of a basic intrusive. The Fe ranges from 40-60%, SiO_2 av. 10%, S and P are absent. The deposit is pockety, but large, covering 20 sq. km.

E. F. H.

North Bavarian ores. DRESCHER. *Z. prakt. Geol.* 1921, 181-7.—Fe ores of local significance occur: (1) in the lower Lias east of Amberg, Oberpfalz, Fe 35%; (2) in the middle Lias in the Hohenzügen, Fe 30-40%; (3) in a ferruginous sandstone of the Jura, Fe 20-38%, locally oölitic; (4) Cretaceous deposits of limonite with hematite, as rich as 50% Fe; (5) in the Alb formation, in very irregular deposits, 28-54% Fe; (6) oölitic Tertiary ores, Fe exceeds 40%.

EDW. F. HOLDEN

Cobalt, its past and future. C. W. KNIGHT. *Eng. Mining J. Press* 113, 761-8 (1922).—A resurvey has revealed new features in the geology of the Cobalt, Ont. district. Most of the Ag comes from veins in the Cobalt series near the Keewatin contact; some occurs in the Keewatin near the Nipissing diabase sill, now known to be 1000 ft. thick. In many instances clay-filled fault fissures have acted as dams to the Ag-bearing solns., delimiting the productive area.

EDW. F. HOLDEN

Microscopic investigations of Canadian cobalt-nickel-silver formations. K. SCHLOSSMACHER. *Z. prakt. Geol.* 1921, 131-4.—The cobaltite of these ores is older than the smaltite, and is penetrated by niccolite. Ag especially replaces niccolite-calcite areas.

EDW. F. HOLDEN

The wolframite-cassiterite deposits of Kami, Bolivia. H. BREHM. *Z. prakt. Geol.* 1921, 33-8.—Mt. Kami is 120 km. east of Oruro. It is made up of quartzite and schist. A quartz-tourmaline-schist, formed through pneumatolytic action by a hidden magma, contains veins of wolframite. The primary part of the veins contains arsenopyrite, tourmaline, quartz, and wolframite; in the oxidized portion is limonite, kaolin, and scorodite with free S. Cassiterite veins contain some pyrite. Alluvial deposits nearby contain cassiterite, wolframite, bismuth, galenite, hematite, magnetite, sphalerite, pyrrhotite, arsenopyrite, and pyrite, only the first being of com. importance. Eluvial deposits also occur.

EDW. F. HOLDEN

Tin ores in northern Nigeria. S. REINHIMER. *Z. prakt. Geol.* 1921, 17-27.—Cassiterite is found in the province of Bauchi. It occurs with topaz, ilmenite, rutile, zircon, garnet, and quartz in alluvial and eluvial deposits; in greisen with quartz and mica; and associated with pegmatites. Most of the cassiterite is distinctly cryst., showing pleochroism, ω yellow-green, ϵ red. There is some "wood tin." The country rocks are cryst. schist, granite, diorite, quartz porphyry, and basalt.

E. F. H.

The primary platinum deposits of the Urals, and the placers. P. KRUSCH. *Z. prakt. Geol.* 1921, 135-7, 155-8.—Pt placers in the region of Ekaterinburg are related to dunite and pyroxenite. Pt occurs in these rocks with Fe and Os, Ir, Pd, Rh, Au, Cu, Ag, Ni, Co, and Mn in solid soln. The dunite and pyroxenite contain all the Pt

which was present in the parent magma before differentiation. Being plutonic they are seldom exposed. **Edw. F. HOLDEN**

Strontianite and strontianite mining in Münsterland. J. BACKUS. *Z. prakt. Geol.* 1921, 145-54, 165-71.—Strontianite was discovered in 1834. It occurs in the upper Cretaceous with marl, in veins averaging 30 cm. Associated minerals are calcite and pyrite. Aqueous solns. containing Ca and Sr bicarbonates deposited the carbonates in fissures. A description of mining methods, uses, and statistics on production are given. **Edw. F. HOLDEN**

Geological notes on the occurrence of phosphates and bituminous coal at Amberg (Oberpfalz). W. KLÜPFEL. *Z. prakt. Geol.* 1921, 49-53.—Thermal solns. locally altered a limestone to $\text{Ca}_3\text{P}_2\text{O}_8$, which erosion has left in residual deposits. The age is lower Tertiary. **Edw. F. HOLDEN**

Origin and classification of the German potash salts. E. FULDA. *Z. prakt. Geol.* 1921, 161-5.—After reviewing theories as to the origin of the salt deposits, F. gives a stratigraphical classification for the several areas. **Edw. F. HOLDEN**

The salt stock of Berechtsgaden as the type of Alpine salt deposits, compared with north German salt deposits. FRANZ BEYSCHLAG. *Z. prakt. Geol.* 1922, 1-6.—The lower Trias salt deposit is composed of the upper "Haselgebirge" and the lower stratified salt. The "Haselgebirge" is a breccia or conglomerate, made up of fragments of shale, or more rarely of salt, gypsum, anhydrite, and polyhalite, in a clayey matrix. It is satd. with salt, averaging 45% NaCl. The primary salt formation is intensively folded and faulted. It contains "salt eyes," cubical crystals in the crystd. matrix, sometimes arranged in layers and elongated; and inclusions of other rocks, which were broken up by the forces which folded the plastic salt. The "Haselgebirge" is interpreted as the residuum left by the soln. of upper portions of the salt member. It is compared with the gypsum covering of some north German salt deposits, which may have had a similar origin. **Edw. F. HOLDEN**

The origin of coal. S. URBASCH. *Naturw. Umschau Chem.-Ztg.* 11, 38-41 (1922).—Kayser's hypothesis concerning the origin of coal is contradicted by the present day evidence that coal is composed of decompn. products of prehistoric plants. Arguments based on the compn. of wood and coal ash must be considered with reference to certain other facts—during the formation of peat, H_2O probably exts. alk. salts according to reactions familiar in soil chemistry. The question is also raised as to whether the present coal beds could have originated at an early period in the earth's history when everything was in a gaseous state. By this theory the principal Zn ore associated with the coal deposits should be the oxide, instead of which sulfide occurs. P. SCHÜTTE. Besides similar objections, data are given to explain the difference in the compn. of wood and coal ash by the possible removal of alkali by CO_2 -bearing waters and by its replacement with NH_3 salts, the NH_3 being a product of the aluminoid decomposition presumably in the peat-forming stage. The small amts. of Zn with the coal deposits are considered as having entered into the compn. of the plant life from which the coal deposit was derived. F. MACUL. The generalized facts that wood ashes consist principally of K carbonate and are P-free, while coal ash contains no alkali are considered to be insecure for a coal theory, and are shown by cited analyses to be not strictly true. Analyses of the ash of deciduous trees show a smaller part represented by alk. carbonates (18.96% for a grown beech) which in exceptional cases reaches 50 per cent, the conifers having a much smaller proportion, the principal constituents being Ca compds. The low P content of charcoal is explained by a small proportion of this element in wood, it occurring mostly in other parts of the plant structure. The absence of alkali in coal ash is qualified by the occurrence of small amts. in certain German coals, K varying from 0.07 to 0.60% and Na from 0.08 to 0.327%. In specifying the P content of German

coals low values (0.390 to 0.541%) are given, which are exceeded by Scottish and especially English coals. A coal from Wales contains 8.63% P. R. T. BRICKSON

Observations on the origin and chemical structure of coal. FRANZ FISCHER AND HANS SCHRADER. *Brennstoff Chem.* 3, 65-72(1922).—A review of the work of the past year in chem., biol. and geological lines indicating the truth of F. and S.'s theory (C. A. 15, 1610) that lignin, rather than cellulose, is the parent substance of coal.

W. B. V.

Subterranean gasification of lignites. LORENZO LANZA. *Rass. min.* 56, 47-9 (1922).—An artificial subterranean system of galleries was constructed on an exptl. scale, whereby the calorific value of the gases conducted through the system could be measured. The air was maintained at various temps. and the relative rapidity and extent of combustion were measured for various coals. The results led to a classification in 3 groups: (1) anthracite and lithanthrax, which require relatively high temps. for distn. and consequent combustion, and which form a dense surface ash approx. 2 mm. thick, impeding further combustion; (2) lignites high in ash, which on drying form cracks which admit air, causing combustion to a depth of 2-20 mm. depending on the velocity of the air (if the air velocity is high, the cinders fall and permit continued and progressive combustion); (3) purer lignites of lower ash from which, owing to their structure, the ash is easily detached and forms a max. depth of 2-3 mm. C. C. DAVIS

The origin of petroleum. HANS v. HÖFER. *Chem.-Ztg.* 46, 317(1922).—With the cooperation of C. F. Maybery the American petroleum series are assigned to H.'s classification as presented at the first petroleum congress in Paris (1900). To the first group consisting of more than 66% of the paraffin series ("methane" oils) belong the petroleum of the Appalachian field in Pa., W. Va., and in the Berea grit (lower Carboniferous). The "naphthene" oils consisting of more than 66 per cent of the naphthene series are found in Texas, La., and Cal. The "naphthene-methane" oils, in which neither the paraffin nor naphthene series of hydrocarbons exceed 66 per cent, occur in Ohio, Ind., and Okla. Geologically the first group is related to the older strongly faulted Paleozoic, the second to the very young and but slightly disturbed Upper Cretaceous and Tertiary. The third group, related to the Upper Carboniferous and Permian, represents a chemical transition between groups 1 and 2. The naphthenes are little altered, while geodynamic processes, together with time, have produced the succession of the "naphthene-methane" and finally the "methane" oils. The above succession with geologic time is opposed to the view of sep. origin for each group. Further evidence favoring this relationship is the presence of the paraffin series in the lighter boiling fraction of the "naphthene oils," the boiling point range of which increases with the progress of metamorphism. The "naphthene" oils were possibly derived from a primary oil of abnormal compn.

F. T. BRICKSON

The geology of oil. V. DOLMAGE. *Mining Eng. Record* 24, 354-6(1919).—This paper reviews the commonly accepted theories on the geology of oil. E. F. H.

Determination of pore space of oil and gas sands. A. F. MELCHER. *Mining & Met.* 1920, No. 160, sec. 5, 22 pp. (sep.).—This method is based on the fact that vol. of pore space = vol. of fragment—vol. of its grains. From these values the % of pore space can be easily calcd. The sample is broken into 2 pieces. One is dipped in paraffin and then immersed in distd. H₂O. From the wt. of H₂O displaced, its temp. and d. being known, the vol. of the fragment is found. A correction is made for the vol. of paraffin coating, detd. from its wt. and known d. The second sample is weighed and crushed; and the d. of the grains detd. with a pycnometer. From these data the d. of the grains is calcd. This method is more accurate and rapid than the H₂O-absorption method. Conclusions, based on examn. of 107 samples, are that no oil sands with a total pore space less than 10.5% are likely to be productive, and that production is dependent upon both pore space and size of grain. EDW. F. HOLDEN

Corundum-sillimanite syenite formed by endomorphism in granites. A. LACROIX. *Compt. rend.* 174, 899-904(1922); cf. C. A. 6, 1730.—A lithologic study of various rocks in Madagascar is reported. Analysis by Raoult of an endomorphous syenite low in corundum from Pontivy gave: SiO_2 47.10, Al_2O_3 40.80, Fe_2O_3 0.76, FeO 1.61, MgO 0.38, CaO 0.46, Na_2O 1.60, K_2O 5.32, TiO_2 1.03, $\text{H}_2\text{O} + 0.92$, $\text{H}_2\text{O} - 0.22$, sum 100.00%.

L. W. RIGGS

Kaolin and kaolinized granite in the district between Ströbel and Saarau, Silesia, and their formation. L. VON ZUR MÜHLEN. *Z. prakt. Geol.* 1921, 56-61.—Descriptions of several deposits are given, with analyses. The kaolin passes gradually into unaltered granite, and was formed by the action on the granite of the waters of Tertiary swamps, whose place is now occupied by lignite which was deposited in them. E. F. H.

The mechanism of placer formation. G. BRAC. *Z. prakt. Geol.* 1921, 177-81.—Ore particles in stream sands are segregated through the action of the stream in carrying off the lighter material in times of active erosion. EDW. F. HOLDEN

Present status of researches on marine sediments in the U.S. T. W. VAUGHAN. *Bull. Nat. Research Council* 3, II, 85-9(1922).—A proper understanding of these sediments includes a knowledge of the depth, temp., and salinity of the waters above them, the distance from the shore where they were deposited, their relations to currents, and if near land, the relief of the land, the rocks composing it and its climate. From such knowledge the boundaries of old seas may be traced, the physiography, constitution and climate of neighboring lands may be recognized and the depth, temp., chem. compn. and currents of the waters of the ancient oceans and the organisms that inhabited them may become known. Work along this line has been too much neglected in the U. S.

L. W. RIGGS

Adsorption- and adhesion-metasomatism. P. KRUSCH. *Z. prakt. Geol.* 1921, 9-13.—The absorption of compds. from true solns. by gel minerals is to be differentiated from the pptn., by adhesion on gel minerals, of substances from colloidal solns. The processes are termed adsorption metasomatism (e. g. ores formed by the impregnation of gel minerals by Ni solns.) and adhesion metasomatism (e. g. sulfides pptd. from colloidal solns. in the presence of limestone or clay). EDW. F. HOLDEN

Manifestations of fire damp occurring in the shafts of the Amelie and Wittelsheim potash mines. M. ROBOERRE. *Bull. soc. ind. Mulhouse* 87, 576-80(1921).—A description is given of the modes of occurrence, pressures and amts. of the inflammable gases in these K mines of Upper Alsace. Remarks on the liberation of fire damp. CHARLES KISSEL. *Ibid* 580-2.—The occurrence of fire damp in the Theodore mine is described.

L. W. RIGGS

Deposit of kaolin at Neckarsteinach (COBENZL.) 19. Mineral sulfides as a source of electrical energy (LIBBY) 4. Natural gas in Neuengamme (HOLTHUSEN) 21. Crystal structure of quartz (HUGGINS) 2. Crystal structure of ammonium fluosilicate (BOZORTH) 2. The crystal structures of aragonite and related minerals (HUGGINS) 2. The crystal structures of marcasite, arsenopyrite, and loellingite (HUGGINS) 2.

DANA, EDW. S. AND FORD, WM. E.: A Text-book of Mineralogy. New York: John Wiley & Sons. 720 pp. \$5.

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, ROBT. S. WILLIAMS

Henry Marion Howe. *Chem. Met. Eng.* 26, 1016-8(1922).—An obituary.

E. J. C.

Heat requirements of chloridizing volatilization. OLIVER C. RALSTON. *Eng. Mining J.-Press* 113, 614-5(1922); cf. C. A. 16, 1558.—A reply to Layng's criticism of the Bureau of Mines' work with an exptl. rotating kiln. Figures are given from the operation of several larger com. kilns showing that the observed oil consumption per ton of ore compares favorably with the calcd. consumption for a stack furnace. Layng's values for heats of vaporization are based on Williamson's formula which is greatly in error at temp. below the b.p. of liquids as in the case of the evapn. of molten chlorides below their b.p. The rotating kiln has thus far proved the best simple furnace for chloridizing volatilization.

LOUIS JORDAN

Notes on the manipulation of osmiridium concentrate. R. A. COOPER. *J. Chem. Met. Soc. S. Africa* 22, 152-4(1922).—The fumes from Os and Ru heated in air are highly injurious to the eyes and lungs. Concentrate should be treated with cold dil. aqua regia to dissolve out Au. The amt. of Pt metals which will also dissolve should be kept at a mini. by leaving about 1% Au undissolved, and the soln. also treated with NH_4Cl to ppt. whatever Pt and Ir is dissolved. In a crucible fusion the Pt metals are not all alloyed with the Pb, and may therefore stick to the crucible and be lost in pouring.

A. BUTTS

Acetylene as a precipitant for cyanide solutions. JOHN GROSS. *Bur. Mines Repts. Inves.* No. 2346, 2 pp.(1922).—When C_2H_2 is passed through cyanide soln. contg. Au and Ag, a black ppt. results which was found to be Ag_2S . This is due to H_2S in the C_2H_2 , formed from impurity in the com. carbide. No Au is pptd. If the C_2H_2 was cleaned before use by passing through NaOH soln., no ppt. at all was formed. C_2H_2 ppts. Ag acetylide from ammoniacal soln. of AgNO_3 , but this is sol. in cyanide soln. Presence of a small amt. of carbide in cyanide prepd. from cyanimide is not deleterious.

A. BUTTS

Features of metallurgy of a refractory gold ore. F. WARTENWEILER. *J. Chem. Met. Soc. S. Africa* 22, 147-52(1922).—A description of the method of treating the ore at Prestea Block A mine, Gold Coast. The Au occurs both free and associated with sulfides of Fe, As, and Sb, distributed through both quartz and graphitic schist. The flow-sheet consists of stamping, regrinding, pan and plate amalgamation, table concn. with roasting and cyaniding of concentrate, and an after-treatment (cf. C. A. 12, 2302) with Na_2S in cyanide soln. The total recovery of the original ore value was 86%, of which 66% was recovered by amalgamation, 16% by cyaniding, and 4% by Na_2S treatment.

A. BUTTS

Sulfatizing roasting of semi-oxidized copper ores. PERCY R. MIDDLETON. *Eng. Mining J.-Press* 113, 629-31(1922); cf. C. A. 15, 2820.—Semi-oxidized Cu ores are roasted in such a manner as to convert a large percentage of the Cu minerals to CuSO_4 . The ore is first heated to a temp. below the ignition point of the S in the ore. Direct oxidation of sulfides of Cu and Fe to sulfates occurs during this stage. The temp. is then gradually raised to 590° causing the FeSO_4 to react with Cu_2S and CuO forming more CuSO_4 . Exptl. roasting in a 10-hearth, 3-ft. diam. Herreshoff furnace produced a calcine contg. 90% of the Cu in sol. form. The temp. of each hearth was carefully recorded and controlled to obtain both stages of roasting during the passage of the ore through the furnace. By regulating the temp. of the lower hearth it is possible to produce either a calcine contg. high water sol. Cu for recovery by pptn. on scrap or sponge Fe, or one contg. any desired percentage of the total (acid) sol. Cu in water sol. form for recovery by electrolysis.

LOUIS JORDAN

Non-ferrous metallurgy in Russia. M. G. KORSUNSKY. *Eng. Mining J.-Press* 113, 813-5(1922).

E. J. C.

Brasids vs. analysis in buying tool steel. ROY H. DAVIS. *Iron Age* 109, 1427-9 (1922).—Arguments for and against standardization.

E. J. C.

Cobalt and its uses. W. R. BARCLAY. *J. Soc. Chem. Ind.* 41, 167-8R(1922).—B. reviews our present knowledge of Co, with special reference to the work of H. T. Kalmus and colleagues. The sources, metallurgical treatment, uses of oxides and salts, properties of metallic Co, comparison of Ni and Co, and Co alloys are briefly discussed.

E. G. R. ARDAGH.

(Blast furnace) lining failures caused by zinc. P. O. MENKE. *Iron Trade Rev.* 70, 1409-10(1922); cf. *C. A.* 16, 1201.—Investigations of several disintegrated blast furnace linings showed the presence of varying amts. from 0.1 to 40% of ZnO absorbed in the body of the brick. It is often present in the ores and limestones from certain regions. It is assumed that it had combined with the alumina in the brick. Its effect, which is accumulative, is to expand and break up the bond. Water-cooling above the mantle seems to accelerate the action. By using a heavy shell, if necessary above 1-in. thick, and removing the water-cooling above the mantle, the trouble can be reduced to a min.

J. L. WINGV.

Notes on zinc dust. A. BILLAZ. *Industrie chimique* 9, 153-7(1922).—Brief description of the various methods of production of Zn dust, its compn. and phys. properties.

A. P.-C.

Metallurgy and crystal structure. The significance of crystallography in metallography. M. VON SCHWARZ. *Giesserei Ztg.* 9, 25-8, 37-41(1922).—An elaborate outline with diagrams and photomicrographs of the application of crystallography to the ultimate structure of metals and alloys. All properties of metals are based on their cryst. structure and orientation, yet most metallographic research has so far dealt with cryst. structure alone.

C. C. DAVIS

The hardness boring machine and its application to the testing of the workability of metals. KESSNER. *Giesserei Ztg.* 9, 47-50(1922).—All attempts to correlate the workability of metals with the ball hardness test have shown that they are not functions of one another. On the assumption that the resistance to working of a metal is a function of both hardness and ductility a machine has been devised by the firm of Alfred H. Schütte, Köln, for measuring workability. It is based on the principle that a borer at a const. load and const. r. p. m. will penetrate to varying depths in different metals. By taking the depth per 100 r. p. m. (d_{100}), the comparative workability of metals was detd. Tests on steels, irons and brasses showed that there was no relation between the results by this method and the ball hardness test. Curves show that a particularly rapid increase in workability of brass occurs with the addition of 0.5-1 % of Pb. The rate of increase diminishes with further additions, and is a max. 'as 12% of Pb. At this point, d_{100} is 14 times its value for brass contg. no Pb. The workability of cast Fe increases rapidly with increase in Si content. P and S alone increase this property. Those types of cast Fe give the greatest value of d_{100} in which a max. of the total C exists in the form of graphite.

C. C. DAVIS

The nickel silver alloys. WALTER VOIGT. *Z. anorg. allgem. Chem.* 120, 309-19 (1921).—Thirty-one samples of different mechanically workable alloys of the Cu-Ni-Zn series were carefully prepd., analyzed, microscopically inspected for homogeneity and drawn down to wires 0.4-0.2 mm. in diam. and part rolled to 0.6 mm. sheets. The elec. resistance, measured by the Wheatstone bridge method, was found to vary with the amt. of hardness from cold work. On heating, the resistance diminishes to a min. After the wires have been heated through the temp. at which this min. occurs, and cooled, they always have the same resistance for a given temp. A table of resistances of the different alloys at 50, 100 and 150° is given. When the Cu-Ni ratio is kept const., the addn. of Zn increases the resistance very little. With const. Cu-Zn ratio, increasing Ni content increases the resistance considerably. With const. Zn content, the Cu being replaced by Ni, the resistance is slightly greater than it would be for the Cu-Ni alloys

and the curve is the same shape. The thermo-elec. potential of the different alloys against Cu was detd. at 50, 100 and 150° and the values obtained by changing the ratio of the metals were found to change in the same manner as the cond. of the wires. The potential of the alloys against Ni in NiSO_4 and Zn in ZnSO_4 corresponds within narrow limits to the potential of Cu itself against these solns. Colors of the alloys are given. All the alloys ppt. Cu from CuSO_4 and are colored brownish red in H_2SO_4 .

F. W. COBB

A study of carburization in the manufacture of synthetic cast iron. C. E. WILLIAMS AND C. E. SIMS. *Trans. Am. Elektrochem. Soc.* 41, (preprint April 1922); *Foundry* 50, 390-3 (1922).—The carburizing ability of different forms of C decreases as the ash content increases and the denser varieties of C are more effective than the more porous ones. The porous nature of charcoal prevents good contact with the metal. Graphite has given the best results. The presence of slag prevents contact between metal and carburizer. This effect is greater with increasing acidity. Lime slags counteract high ash and may, by forming CaC , aid carburization. Addition of Si carbide introduces, both Si and C but its use is limited by the amt. of Si desired. Neither Si nor P have any effect on the rate or degree of carburization. Mn increases both the rate and degree, although this increase is so small as to be negligible for amts. usually carried in cdm. iron. S probably decreases the rate and degree. Increase in the temp. from 1350° to 1450° has no noticeable effect.

W. E. R.

Wood-Harry cleaner and concentrator (ANON) 1. Reactions in gas generators and blast furnaces (JÜPTNER) 2. Operation of the electric blast furnace (SEIGLE) 4. Metallurgical coke (Jap. pat. 33,726) 21. Recovering S gases (U. S. pat. 1,412,452) 18. Potassium values from fumes (U. S. pat. 1,414,353) 18.

Foundrymen's Handbook. Cleveland: Penton Publishing Co. \$5.

Jahrbuch Eisen und Stahl 1921-2. Part I. Schwerindustrie. Essen: Gerhard Knop. 418 pp. Reviewed in *Z. Ver. deut. Ing.* 66, 243 (1922).

SCHWARZ, M. V.: Giesserei- und Hüttenwesen mit Einschluss der Metallkunde, Metallurgie, des Berg- und Material-Prüfungswesen. Band I. "Das Fachbuch." München: J. A. Mahr. 164 pp. M10.

VOISIN, JEAN: Les métaux précieux. Paris: J. B. Baillière et fils. 19 rue Haute. 264 pp. 25 fr. Reviewed in *Rev. metal.* 19, 118 (1922).

WHITLEY, B.: Iron-founding. London, New York: I. Pitman and Sons, Ltd., 131 pp.

WYSON, HENRY. Metallurgy. 2nd Ed. Easton, Pa.: Chemical Publishing Co. 391 pp. \$3.50.

Concentrating ores. A. C. VIVIAN. Brit. 175,333, Oct. 7, 1920. The values in ores, concentrates, and like mixts. contg. metals or metallic compds. are provided with a coating of a metal, or of a metalloid such as As, by a wet pptn. method, without external supply of elec. energy, with a view to facilitating their sepn. by flotation, amalgamation, electrostatic sepn., and other methods. E. g., the mixt. may be treated with a soln. of a salt which will cause spontaneous pptn. of a metal or metalloid, such as solns. used in the formation of Ag or Cu mirrors, or with a soln. adapted to yield a ppt. with a metal, such as a soln. of CuSO_4 and Zn dust or Fe.

Concentrating ores. R. J. LEMMON, H. L. SULMON and MINERALS SEPARATION, LTD. Brit. 175,384, Nov. 11, 1920. Gold is recovered from pyritic ores by froth flotation, with the use of a pulp which is neutral or slightly alk., and a frothing agent which contains phenol or cresol or both, preferably unwashed coal tar or wood tar with or without the addition of cresol or blast-furnace creosote or both. There may also be added to

the pulp a small proportion of one or more paraffin hydrocarbons such as paraffin oil. The gold is obtained accompanied by the pyrites. In some cases, after applying a flotation process or not, the pulp may, as described in 26,019, 1909 (C. A. 4, 2806), be treated with a sol. salt such as FeSO_4 , and a sulfide then added to the ppt.

Ore-concentrating apparatus. F. GROCH. U. S. 1,413,723-4, Apr. 25. Flotation app.

Ore flotation separation. D. W. PATTERSON and H. L. WOOLFENDEN. U. S. 1,412,215, Apr. 11. The gummy material of "black liquor" from treatment of vegetable material is used as a frothing agent.

Ore separator and amalgamator. O. A. BURGESS. U. S. 1,412,673, Apr. 11.

Consolidating scrap metal. L. JONES. Brit. 175,686, Oct. 18, 1920. See U. S. 1,354,492 (C. A. 15, 51).

Recovering metals. K. HESS. Brit. 175,242, Oct. 25, 1921. Addition to 150,875 (C. A. 15, 1009). The process described in the principal patent for recovering metals from chippings, etc., by treatment in a molten salt bath is improved by imparting motion to the bath, e. g., by mounting the furnace for continuous rotation about a shaft.

Recovering metal values from slag. H. V. WATCH. U. S. 1,414,491, May 2. Molten metallurgical slag such as that from Cu smelting is treated with NaCl , CaCl_2 or CaF_2 and air at a sufficiently high temp. to effect volatilization of metallic values such as CuCl_2 and the volatilized material is collected.

Apparatus for disintegrating and crushing mat. J. H. HICKBY. U. S. 1,413,116, Apr. 18. Molten mat is disintegrated by the action of an air blast and the disintegrated mat is passed between granulating rolls.

Pickling and rolling metals. A. SUNDB. U. S. 1,412,979, Apr. 18. Features.

Wrought iron. J. ASTON. U. S. 1,412,823, Apr. 18. The molten substantially slagless product of a steel-making process is poured into a slag bath to effect granulating and the product is then formed into a coherent mass. Cf. C. A. 15, 1690.

Wrought iron. J. ASTON. U. S. 1,413,513, Apr. 18. A coherent mass is formed from the granulated substantially slagless product of a steel-making process together with a slag adapted for producing wrought Fe and the mixt. is compressed to form blooms.

Addition of silicon to melted pig iron. GENTSU TANAKA. Japan 38,606, May 9, 1921. A mixt. of 100 parts powd. Fe-Si, 1 fluorspar, 5 charcoal, 3 lime or soda ash is melted in the absence of air and added to melted Fe in a cupola and agitated for sepn. of C.

Purifying cast iron. J. R. BILLINGS. U. S. 1,412,077, Apr. 11. Crude molten Fe is treated with NaNO_3 or CaO and CaF_2 to remove H and P, and finely divided C is then gradually introduced into the metal.

Coating iron or steel with lead. J. H. MADDY. U. S. 1,413,343, Apr. 18. The metal is successively coated with Cu, Hg and Pb to produce an unbroken covering. Cf. C. A. 15, 3270.

Purifying tin. J. J. COLLINS. U. S. 1,414,257, Apr. 25. Impure Sn, Cl and H_2O are placed in a reaction vessel contg. Sn chloride and liquor contg. SnCl_4 is drawn off as the reaction proceeds.

Extracting tin from oxide. J. J. COLLINS. U. S. 1,414,258, Apr. 25. Rock or other Sn oxide-bearing material is crushed and reduced and the Sn-bearing mass is then treated with Cl to form SnCl_4 .

Purifying tin. J. J. COLLINS. U. S. 1,414,259, Apr. 25. An excess of impure Sn is caused to react with SnCl_4 to form SnCl_4 and the latter is dehydrated, fused and electrolyzed to obtain pure Sn and SnCl_4 .

Tin from scrap tin-plate. C. CLERC. U. S. 1,413,555, Apr. 18. Sn scrap is treated with SnCl_4 *in vacuo* and Sn is pptd. from the soln. thus obtained by the action of Zn, Fe or other pptg. agent.

Zinc dust. F. P. LANNON, JR. U. S. 1,412,621, Apr. 11. A charge of molten Zn-bearing material is heated in a retort to vaporize Zn, and the Zn vapor is freed from spelter or liquid and is collected as "blue powder" in a chamber the outlet from which is sealed by accumulated powder.

Metal hardening and annealing furnace. B. M. WALPOLE. U. S. 1,412,152, Apr. 11.

Furnace for heat-treating small metal articles. E. F. COLLINS. U. S. 1,414,180, Apr. 25.

Annealing furnace. R. C. STIEFEL. U. S. 1,414,489, May 2.

Alloys. J. DUNKLEY and E. J. RYAN. Brit. 175,516, Jan. 16, 1921. A white-metal alloy is made by alloying $24\frac{1}{4}$ parts of Cu, $14\frac{1}{4}$ parts of Zn, $9\frac{1}{4}$ parts of Ni, 2 parts of Pb, $\frac{1}{2}$ part of phosphor Cu, and $\frac{1}{8}$ part of Al, with the aid of a flux of broken glass and charcoal.

Aluminum alloy. F. C. FRARY. U. S. 1,412,280, Apr. 11. An alloy adapted for hot rolling is formed of Al with Cu 4-6, Mg 0.3-2 and Ca 0.3-2%.

Copper alloy. J. E. SPRINGER. U. S. 1,413,880, Apr. 25. An alloy adapted for structural use where exposed to the weather is obtained from a charge of Cu 20%, Ni 5%, Zn 5%, W 5%, Fe 2%, Mn 5%, furnace slag 50% and humite 3%. After molding, the alloy is annealed.

Chromium alloys without carbon. MASAAKI YONEZU. Jap. 38,722, May 25, 1921. Cr alloys are manufd. from pure CaCrO_4 , prepd. from Na_2CrO_4 and CaCl_2 and dried at 200° , and corresponding metals by the thermite method. E. g., a mixt. of CaCrO_4 , powd. chromite and Al powder is burned in a crucible, Cr-Fe for special steel being produced. Cr-Cu, Cr-Al or other alloys are prepd. by the same method. Cf. C. A. 15, 3609.

Solders. C. P. ORMISTON. Brit. 175,228, Oct. 4, 1921. Solders for Al and other metals and alloys are made by melting Sn and Zn with a previously prepd. hardening alloy consisting of 1 part of brass, $1\frac{1}{2}$ parts of Al, and $\frac{1}{2}$ part of Ni. One part of the hardening alloy may be combined with 28 parts of Zn and 56 parts of Sn, or with 36 parts of Zn and 112 parts of Sn. In melting the Sn and Zn with the hardening alloy, cetaceum is used as a flux and refining agent.

Solder for aluminium. SÔTARÔ KIKUDA. Jap. 38,783, June 1, 1921. It is made by fusing together a powdered alloy of 1 part Al and 0.3 Zn, a fused mixt. of 1 part pine resin and 2 NH_4Cl , and a fused mixt. of 10 parts Sn and 5 Zn. Al in the solder uniformly covers the surface of the soldered part.

Soldering aluminium and aluminium alloys. A. PASSALACQUA. Brit. 176,006, Feb. 27, 1922. In the soldering of Al or Al alloys, a soln. in H_2O of the chloride, chlorate, borate, and sulfate of Na and MgCl_2 is mixed with a paste contg. equal quantities of paraffin and stearic acid in the proportion of 1 part of liquid to 60 parts of paste. The Al rod or metal to be applied is dipped into the mixt. and the soldering is effected with a blowpipe. Cf. C. A. 15, 2060.

10—ORGANIC CHEMISTRY

CHARLES A. ROULLER

Beckmann rearrangement. JAKOB MEISENHEIMER. Ber. 54b, 3206-13(1921).—From the results of the Beckmann rearrangement, the benzil α - and β -monooximes have been assigned the structures I and II, resp., it being assumed that intramol. reactions

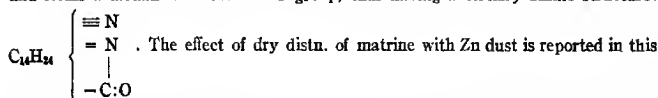
occur the more easily the nearer the reacting groups are to each other in space. No facts of any kind are known in support of this assumption and a reaction has now been found which shows that, as a matter of fact, it is the *anti*-groups which are involved in the Beckmann rearrangement. As shown in the preceding abstr., triphenylisoxazole (A) on oxidative degradation of the isoxazole ring yields a $\text{PhC}(\text{:NOBz})\text{COPh}$ (B), in which, since it is formed by the rupturing of a C:C union, the two C:O groups must be adjacent, *i. e.*, it must be the Bz deriv. of that henzil monoöxime in which the oxime HO and the Bz groups are in the *syn*-positions; as a matter of fact the product is the β -compd., in which it has hitherto been assumed that the groups in question are in the *anti*-positions, so that the α -compd. really has the structure II and the β -form the structure I. In view of the bearing which this observation has on the use of the Beckmann rearrangement for the detn. of configurations it became important to det. that B is really the primary product of the oxidation of A, which was effected at first with CrO_3 in boiling AcOH , conditions under which the possibility of a rearrangement is not entirely excluded. The Bz deriv. (C) prepd. from the α -oxime does not rearrange into B in boiling AcOH , but in view of the uncertainty as to the structure of C (see below) this is not conclusive evidence. Later it was found that the oxidation of A can be effected much more satisfactorily with O_3 in cold CCl_4 , the ozonide being decompd. with cold H_2O ; under these conditions the possibility of rearrangement is excluded. That there is no reversal of the stereochem. structure is indicated by the fact that with dil. NaOH B regenerates the β -oxime. Attempts to prep. the henzoate of the α -oxime with BzCl in $\text{C}_6\text{H}_5\text{N}$ gave the compd. III obtained by Werner and Piguet (*Ber.* 37, 4304(1904)) from the α -oxime in $\text{C}_6\text{H}_5\text{N}$ with PhSO_2Cl , so that, contrary to the β -oxime, the α -compd. undergoes the Beckmann rearrangement even with BzCl in $\text{C}_6\text{H}_5\text{N}$ at 0° . In view of the above facts, the structures at present assigned to the 3 henzil dioximes must also be changed, the α - and β - becoming the *anti*- and *syn*-forms.



resp., and the γ - remaining the *amphi*-compd.; the chem. behavior of these oximes agrees much better with the new than with the old structures. That C is really III is confirmed by the fact that with dil. NaOH it smoothly yields PhCN and 2 mols. BzOH .

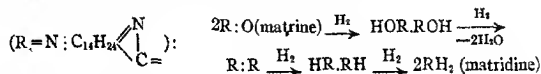
C. A. R.

Constitution of matrine. I. H. KONDO AND S. SATO. *J. Pharm. Soc. Japan* No. 474, 659-79(1921).—The constitution of matrine, discovered by Nagai (*Ibid* No. 64), is not known except that it has the compn. $\text{C}_{15}\text{H}_{21}\text{N}_3\text{O}$, and is a monoacidic tertiary amine, one of the N atoms has a nitrile structure, and assumes the basic ammonium structure with MeI , while the other N is in the γ (?) position to the C of a $>\text{C}:\text{O}$ group, and forms a lactam with the $>\text{C}:\text{O}$ group, thus having a tertiary amine structure:



paper. A mixt. of matrine-HCl with Zn dust (1:14) is distd. in a hard glass tube into HCl . The distillate is made strongly alk. with KOH , and sepd. by steam, into a volatile (A) and a non-volatile portion (B). A is converted into the HCl salt, concd., and treated with satd. HgCl_2 . The resulting cryst. double salts are treated with solid KOH , and extd. with Et_2O . This Et_2O -sol. fraction contains 2 parts (C), b.p. 87° , and (D), which does not dist. even at 160° . C is a transparent oil, $\text{C}_{10}\text{H}_{13}\text{N}$, h. $188-9^\circ$, does not give the nitroso reaction with HNO_2 and β -naphthol, and is therefore a ter-

tertiary amine. It forms double salts with the chlorides of Au, Pt, Hg, and with picric acid (Au salt m. 143–4°, Pt salt decomp. 216–7°, picrate m. 165°). It combines with 1 mol. of MeI (m. 241°). D is a light brown transparent oil and gives long needles on standing. The product seps. from petroleum ether in long, white, columnar crystals, m. 76°, sol. in cold H₂O, becomes milky in hot H₂O and forms a double salt with K₂CrO₇ in HCl soln. similar to matrine. Its compn. is C₁₁H₁₄N₂, and it differs from matrine in the following respects: the Au salt m. 216° (Au salt of matrine m. 198°); it cannot be saponified, and sublimes on heating. It is probably formed by loss of O₂ from the >C:O group of matrine, forming :CH₂. This new compd. is named by K. and S. *matridine*. The following reaction mechanism is suggested:



Matrine is first reduced, with formation of a pinacol between the >C:O groups of 2 mols. matrine; an olefin is then formed by loss of O, and by further reduction 2 mols. matridine are formed. The compd. C₁₀H₁₀N₂ is probably a further decomp. product of matridine. The fraction B contains 3 substances, which have not yet been identified with certainty. II. H. KONDO, N. KISHI AND CH. ARAKI. *Ibid* No. 478, 1047–09.—In order to test out the correctness of assumption made in the reduction of matrine to matridine (see preceding abstr.), K., K. and A. used different methods of reduction: *Reduction by Na and amyl alc. at a boiling temp.* To matrine in boiling anhyd. AmOH (15 vols.) under a reflux Na (1.7 times that of matrine) is gradually added through the condenser. The boiling is continued until the Na is completely dissolved. Two products were isolated, *desoxymatrine* (A), (C₁₃H₁₈N₂)₂, and *desoxymatrine oxide* (?) (B). A m. 162°, crysts. from hot acetone in columnar form, from Et₂O in longer crystals, insol. in H₂O, unsaponifiable by KOEt, corresponds in compn. to 2 mols. of matrine minus O. The double salts with Au, Hg, and picric acid are either amorphous or resinous ppts.; only the Pt double salt forms orange-yellow plates, decomp. 234°. When A is treated with MeI, *desoxymatridine methiodide* is formed, needles, m. 178°, sol. in H₂O, insol. in Et₂O. The iodide, when treated with AgCl, gives (C₁₀H₁₄N₂)₂2MeCl, which forms characteristic double salts (Au salt, yellow needles, m. 180°; Pt salt, orange-yellow crystals, decomp. 282°; picrate m. 109°; Hg salt m. 175–80°). An attempt to obtain matridine from A by further reduction with Na and AmOH was not successful. When treated with HI (d. 1.7) and red P, however, 2 compds. were formed: Et₂O-insol. needles (C) and Et₂O-sol. needles (D). C, (C₁₃H₁₈N₂)₂ (which is A minus 1 mol. H₂O), m. 160°, is named *bismatridine*. The nature of D has not yet been investigated. B, (C₁₄H₁₄N₂)₂, an amorphous yellow compd., can be sepd. from A by 40% alc., but can not be obtained in cryst. form. It is sparingly sol. in H₂O, but sol. in ordinary org. solvents, m. about 120°, and is unsaponifiable with KOEt. It is provisionally named as *desoxymatrine oxide*. Electrolytic reduction was tried on matrine both in strong and weak acid solns., but no definite results were noted. S. T.

Shifting of the olefinic bond in the presence of acid catalysts. A. GILLERT. *Bull. soc. chim. Belg.* 29, 192–9 (1920).—The butylene obtained from *n*-butanol depends on the catalyst used; G. shows that this involves a secondary change, as the catalysts that yield isobutylene from butanol are also capable of forming this substance from *n*-butylene. Further, the change is a general one as CHRIVRVCRIII:CRIRII → CRIVRV:CRIIICHRIRII, when RIVRV are more positive than RIRII. Certain exceptions to this general reaction have enabled the mechanism of the reaction to be investigated. J. C. S.

Importance of the olefin gases and their derivatives. IV. Isopropanol (isopropyl

alcohol). GHO. O. CURME, JR., AND E. W. REID. *Chem. Met. Eng.* 25, 1049-50 (1921); cf. C. A. 16, 899.—This alc. obtained from propylene was first introduced commercially in this country in 1920. Its present and proposed industrial applications depend upon: its close relation to EtOH in phys. and solvent properties; its nonpotability; its lack of serious physiol. effects and its germicidal action. *There is much work to be done on its strictly chem. applications.

G. W. STRATTON

Importance of the olefin gases and their derivatives. V. Ethylene chlorohydrin and ethylene oxide. G. O. CURME, JR., AND C. O. YOUNG. *Chem. Met. Eng.* 25, 1091-2 (1921).—Ethylene chlorohydrin (A) is formed by the action of HOCl on gaseous C_2H_4 ; the C_2H_4 may be passed into faintly acidified solns. of hypochlorites, or Cl and C_2H_4 may be passed together into cold H_2O . In the usual method of prepn. $C_2H_5Cl_2$ is formed as a by-product after the concn. of A has reached 5-6%. By the use of a recirculation system a concn. of 10-12% of A may be obtained with no appreciable $C_2H_5Cl_2$ formation. A is a colorless liquid of faintly ethereal odor, b_{760} 128°, d_4^{15} 1.2130; it forms a const. boiling mixt. with H_2O containing 42.3% of A, b_{760} 96.0°, d_4^{15} 1.0970; anhydrous A possesses the solvent characteristics of both the alics. and the org. chlorides. A condenses directly with $PhNH_2$ to give hydroxyethylaniline, which on caustic fusion gives indoxyl; with Na_2S A gives thioglycol, from which mustard gas is formed by the addition of HCl; PbBr and A give through the Grignard reaction PhC_2H_4OH ; aminobenzoic acid esters and A give novocaine. Strong caustic alkali splits HCl off from A with the formation of ethylene oxide, b_{760} 12.5°, d_4^{15} 0.8966. $(CH_2OH)_2$ is prepd. by the action of $NaHCO_3$ on solns. of A.

T. S. CARSWELL

The chlorination of acetylene dibromide [α,β -dibromoethylene] by antimony pentachloride. H. VAN DE WALLE. *Bull. soc. chim. Belg.* 28, 304-9 (1919).—When $SbCl_5$ is added drop by drop to $(CHBr)_2$, a mixt. of products is obtained, as follows: α,β,β -Trichloro- α -bromoethane, b. 172°, b_{20} 68°, $d_4^{14.6}$ 1.9592, $n_D^{14.5}$ 1.52915, $n_D^{14.6}$ 1.53246, $n_D^{14.6}$ 1.54080, $n_D^{14.6}$ 1.54787; α -chloro- α,β -tribromoethane, b. 220° (decompn.), b_{10} 99°, m. 20.55°, d_4^{14} 2.6518, n_D^{14} 1.60077, n_D^{14} 1.60527, n_D^{14} 1.61693; and $CHClBrCHClBr$ (cf. Chavanne, C. A. 6, 1605). The first-named compd., when reduced by Zn, gives $(CH_2Cl)_2$, and the last, on reduction, gives a mixt. of α,β -dichloro- and α -chloro- β -bromoethylene. To find an explanation of the result of the second reduction, chloral was brominated with Br and PCl_5 and the resulting trichlorodibromoethane reduced by Zn; $CHCl:CCl_2$ was obtained. Under similar conditions, $CHCl:CHO$ gave $CHCl:CHBr$, which on reduction gave a mixt. of α,β -dichloro- and α -chloro- β -bromoethylene.

J. C. S.

The ethylenic isomerism of chlorobromoethylene. H. VAN DE WALLE. *Bull. soc. chim. Belg.* 28, 369-75 (1919).—The mixt. of stereoisomeric chlorobromoethylenes obtained by the chlorination of dibromoethylene with $SbCl_5$ and subsequent reduction with Zn has been resolved into its components by fractional distn. of the material in the presence of alc. The *cis*-isomeride b. 84.5-4.7°, d_4^{15} 1.7972, n_D^{15} 1.50472, n_D^{15} 1.49817, n_D^{15} 1.48143; and the *trans*-isomeride m. 41°, b. 75.2-5.4°, n_D^{15} 1.50594, n_D^{15} 1.49976, n_D^{15} 1.48326. These two isomerides do not apparently undergo isomerization in sunlight in the presence of a trace of Br, but in diffused light the *cis*-isomeride shows an increase in its d. and n, while the *trans*-isomeride shows a decrease.

J. C. S.

α,β -Dichloro- α -bromoethylene. H. VAN DE WALLE. *Bull. soc. chim. Belg.* 29, 186-9 (1920); cf. Swarts, *Bull. acad. roy. Belg.* (iii) 36, 519-31 (1898).—A considerable quantity of the substance was fractionally distd. to obtain, if possible, the two stereoisomerides. A single substance was obtained, and further attempts at resolution into a mixt. were unsuccessful. α,β -Dichloro- α -bromoethylene solidifies at -83.5°, b. 113.8°, d_4^{15} 1.9133, n_D^{15} 1.51795, n_D^{15} 1.52188, n_D^{15} 1.53276.

J. C. S.

Preparation of the stereoisomerides of α,β -dichloro- α -bromoethylene. H. VAN DE WALLE. *Bull. soc. chim. Belg.* 29, 322-6 (1920).—Two stereoisomeric dichlorobromoethylenes were obtained by the reduction of dichlorotribromoethane by Zn in abs. alc. They were sepd. as binary mixts. with alc. by repeated fractional distn. of the product. The stable isomeride was identical with that previously obtained by the action of PhNH_2 on dichlorodibromoethane, and it formed a binary mixt. with alc., b. 77.2-76°, contg. 69.1% of alc. The unstable isomeride formed with 34.5% of alc. a fraction b. 74.7-5.2°. The proportion of the isomerides formed was 72.4% of the unstable and 27.6% of the stable compd. On pptg. from the binary alc. mixt. with water the unstable stereoisomeride, which initially had n_D 1.51592, rapidly changed to the stable comp. having n_D 1.52182. It was not possible to establish the spatial structure of the compds. by the action of alc. KOH, as the velocity of attack was the same in each case, owing probably to rapid isomerization. J. C. S.

α,β -Dichloro- α,β -dibromoethylene. H. VAN DE WALLE. *Bull. soc. chim. Belg.* 29, 307-8 (1920).— $(\text{CHCl})_2$ was converted by bromination in sunlight into $(\text{CHClBr})_2$, which on distn. with the theoretical amt. of PhNH_2 lost HBr and gave $\text{CClBr}:\text{CHCl}$. On further bromination, α,β -dichloro- α,β -tribromoethane was obtained. It is a lachrymatory liquid, b_{16} 112°, m. 5.95°, d_4^{15} 2.6346, n_D 1.60846, converted by alc. KOH into α,β -dichloro- α,β -dibromoethylene, b_{160} 172°, m. 4.4°, d_4^{15} 2.3036, n_D 1.57984. The compd. was a single chem. individual, representing only one of the two possible stereoisomerides. J. C. S.

Ethylenic isomerism of the α,β -dihromopropylenes. H. VAN RISSEGHEM. *Bull. soc. chim. Belg.* 28, 376-81 (1919).—By fractional distn. with alc. of the mixt. of stereoisomeric α,β -dibromopropylenes obtained by the action of NaOPh on $\text{CHBr}_2\text{CH}_2\text{Br}$, the two isomerides have been sepd. after decomp. the proper binary mixts. with water. The *cis*-isomeride b_{160} 135.2° \pm 0.2, $d_4^{17.4}$ 2.0235, $n_D^{17.4}$ 1.52935, $n_D^{17.4}$ 1.53371, and the *trans*-isomeride b_{160} 125.95°, $n_D^{17.4}$ 1.53232, $n_D^{17.4}$ 1.53087. These two isomerides undergo isomerization in sunlight in the presence of a trace of Br to give an equil. mixt. contg. 35% of the *cis*- and 65% of the *trans*-isomeride. J. C. S.

The formation of dibutylbutyl in the preparation of butyl alcohol by hydrogenation of crotonaldehyde. H. VAN RISSEGHEM. *Bull. soc. chim. Belg.* 28, 335-9 (1919).—Among the products of hydrogenation of crotonaldehyde, by passing its vapor along with H over reduced Ni at 130°, R. has obtained a considerable amt. of dibutylbutyl, $\text{CHPr}(\text{OCH}_2\text{Pr})_2$, b_{16} 105-9°, $d_4^{14.6}$ 0.8589, $d_4^{17.6}$ 0.8578, $n_D^{14.6}$ 1.4213, $n_D^{14.6}$ 1.4234, $n_D^{17.6}$ 1.4280, $n_D^{17.6}$ 1.4189, $n_D^{17.6}$ 1.4211, $n_D^{17.6}$ 1.4262. This butyl may also be prepd. by heating together BuOH and PrCHO in the presence of a little $\text{MeC}_4\text{H}_9\text{SO}_3\text{H}$. J. C. S.

Symmetrical dichlorodimethyl sulfide (di[chloromethyl] sulfide). IGNAZ BLOCH AND FRITZ HÖHN. *Ber.* 55B, 53-7 (1922).—When 160 g. trithioformaldehyde (A) is cautiously treated cold with 204 g. distd. S_2Cl_2 , refluxed about 1 hr. and distd., there is obtained, besides some CS_2 , 90 g. sym-dichlorodimethyl sulfide (B), faintly yellowish oil of peculiar ethereal CHCl_3 -like odor, b_{16} 51°, b_{165} 156-6.5°, mol. wt. in freezing C_6H_6 127.5. Heated 12 hrs. on the H_2O bath with H_2O , B gradually deposits a ppt. containing cryst. A and amorphous polyhydroxymethylene while the filtrate on heating at first develops a violent stink, then the odor of HCHO ; it is assumed that $\text{S}(\text{CH}_2\text{OH})_2$ is first formed and decomps. into HCHS , HCHO and H_2O . With KOH or NH_3 in boiling MeOH, B gives dimethoxydimethyl sulfide, liquid of aromatic and ethereal, but at the same time of unpleasant odor, b_{160} 152°, probably identical with de Lattre's "methyl ether monosulfide," b_{16} 62° (C. A. 7, 1361). In view of the above formation of B and

A, A probably has the structure $\text{S} \begin{array}{c} \text{CH}_2\text{S} \\ \text{CH}_2\text{S} \end{array} \text{CH}_2$. This work was done in 1911,

hence long before Pope's address of Mar. 27, 1919 (*C. A.* 13, 1271) which gives the impression that the use of S_2Cl_2 for prep. chlorinated org. sulfides was a novelty of the war years and an English discovery.

C. A. R.

Production and reactions of β,β' -dichlorodiethyl sulfide. F. G. MANN AND WM. J. POPE. *J. Chem. Soc.* 121, 594-603 (1922).—The action of Cl on $(CH_2ClCH_2)_2S$ gives a mixt. of various Cl derivs. α,β,β' -Trichlorodiethyl sulfide (A), b_{14} 106.5-8°, $d_4^{21.8}$ 1.4219, and gives a sulfoxide, long needles, m. 69°. $\alpha,\beta,\beta,\beta'$ -Tetrachlorodiethyl sulfide (B), b_{14} 123-5°, $d_4^{15.2}$ 1.5441, and forms a sulfoxide, long needles from H_2O , m. 121°. $\alpha,\alpha,\beta,\beta,\beta,\beta'$ -Hexachlorodiethyl sulfide, b_{14} 160-1°, $d_4^{10.6}$ 1.6944. These 3 compds. are devoid of vesicant properties and have much lower m. ps. than mustard gas. They do not form addition compds. with Br, nor do they react readily with HNO_3 . On passing dry Cl into $(CH_2ClCH_2)_2S$ and finally heating at 100° in a current of Cl, SCl_2 dists. over; the product, on distn., gave S_2Cl_2 , C_2H_5Cl , C_2H_3Cl , and C_2Cl_6 . It thus appears that the first decompn. products of $CCl_3CCl_2SCH_2CH_2Cl$ are SCl_2 , C_2Cl_6 and C_2H_5Cl . The action of S_2Cl_2 upon $(CH_2ClCH_2)_2S$ slowly produces A and B at the ordinary temp. and B in smaller yield at 100° or at the boiling temp. The foaming which occurs during the distn. is probably due to the removal of HCl from $(CH_2ClCH_2)_2SCl_2$. The action of SCl_2 upon $(CH_2ClCH_2)_2S$ results in the formation of S_2Cl_2 , HCl and A. About 4 mols. of SCl_2 can be added before the red color becomes persistent for any considerable time. The S which is found is probably due to the reaction of S_2Cl_2 . There is evidence that some CH_2ClCH_2SCl is also formed by the action of SCl_2 on $(CH_2ClCH_2)_2S$, although the pure compd. has not been isolated, and some $(C_2H_5)_2S_2$ also results. On passing dry C_2H_4 into strongly agitated SCl_2 at 0°, the ruby-red color of the SCl_2 changes to straw-yellow before the proportion of C_2H_4 absorbed is sufficient to account for the formation of $(CH_2ClCH_2)_2S$. When this product is distd., SCl_2 and S_2Cl_2 come over first, followed by CH_2ClCH_2SCl , b_{14} 95-130°. No evidence of the presence of $(CH_2ClCH_2)_2S$ was obtained. If the reaction be carried further, the S_2Cl_2 will react to form $(CH_2ClCH_2)_2S$.

C. J. WEST

The Grignard reaction. G. J. OSTLING. *Hyllningskrift tillägnad Ossian Aschan* 1920, 92-7.—An attempt was made to make ketones by means of the Grignard reaction. $PhMgBr$ reacted on $BzCl$ giving a trace of $PhCO$. All other expts. gave negative results.

C. E. CARLSON

The reverse pinacol in transformation. BERTIL NYBERG. *Hyllningskrift tillägnad Ossian Aschan* 1920, 98-102.—Pinacolyl alc. heated with anhyd. $(CO_2H)_2$ for 3 hrs. gives a neutral ester, a pale yellow oil, d_4^{20} 0.9433, n_D^{130} 1.30°, n_D^{252} 1.24°, and an acid ester which is unstable. With these esters the reverse transformation was tried. (1) The acid ester was heated to 115° with anhyd. $(CO_2H)_2$. The distillate fractionated h. 65-9°, d_4^{20} 0.6870, n_D 1.40451, M 29.53; b. 70-2°, d_4^{20} 0.7072, n_D 1.41230, M 29.61, which oxidized with $KMnO_4$ gave an oil, which combined with water to form crystals m. 44° (pinacol). There was also formed pinacolyl alc. h. 118-20°, and an ester $C_6H_{11}O_2CH_3$, b. 125-7°, whose constitution has not been detd. (2) The acid ester was heated to 130-40°, with considerable formation of HCO_2H ; this was removed from the distillate with soda. The same fractions were obtained from the distillate as above. The residue in the flask contained $(CO_2H)_2$, unchanged acid ester, considerable neutral ester, b_{14} 135°, and a small amt. of unsaponifiable material b_{14} 180-200°, undoubtedly a polymer of C_6H_{11} . (3) The neutral ester was heated to 130° without any reaction but by lowering the temp. to 110° distn. began after 2 hrs. and the same fractions were obtained as in (1) with the acid ester. To prove the esters were intermediate products the transformation temps. were detd.: (1) pinacolyl alc. + 5 mols. anhyd. $(CO_2H)_2$, 105°, (2) acid oxalic acid ester + 4 mols. anhyd. $(CO_2H)_2$, 105°, (3) acid oxalic acid ester, dissociation temp. 133°, (4) neutral oxalic acid ester + 4.5 mols anhyd. $(CO_2H)_2$, no transformation even

at -135° . $(\text{Me}_2\text{C}=\text{O})_2$ was heated with $(\text{CO}_2\text{H})_2$ but as yet no positive results have been obtained.

C. E. CARLSON

Formation of hydrocyanic acid by oxidation of formaldehyde in the presence of ammoniacal silver. R. FOSSE AND A. HENKELLER. *Compt. rend.* 174, 1021-23 (1922); cf. C. A. 16, 1078.—HCN can be isolated in 30-7% yield by treating 0.01 g. HCHO in the presence of 10-20 cc. concd. NH_4OH , 1.7 g. NH_4Cl , and 1 cc. $N\text{AgNO}_3$ with 5 g. KMnO_4 . By heating with NH_4Cl for 1 hr., $\text{CO}(\text{NH}_2)_2$ is formed (95% of the wt. of HCHO), which can be isolated as dioxanthylurea.

I. P. ROLF

Hydroxylamine. CARL KJELLIN. *Swensk Kem. Tids.* 33, 213-28 (1921).—The constitution of NH_2OH is discussed and of the many references, Haber, *Ber.* 29, 2444, seems most pertinent. The new data are presented under 7 heads: (1) $\text{NH}_2\text{OH} + 2\text{Fe}(\text{OH})_3 + \text{H}_2\text{O} \rightarrow \text{NH}_3 + 2\text{Fe}(\text{OH})_3$. The NH_3 produced agrees with the theoretical within a few hundredths % when the KOH in the solns. does not exceed 1.75%. With more KOH the agreements are also fair. In similar expts. using RNH_2 in place of the NH_2OH the agreements between the wts. of $(\text{RNH}_2)_2\text{PtCl}_6$ and theoretical were also good (R representing Me, Et, and Pr). (2) $\text{Sn}(\text{OH})_2 + \text{NH}_2\text{OH}$. Like the results in (1) with less satisfactory agreements of analysis and calcons. (3) $\text{Mn}(\text{OH})_2 + \text{NH}_2\text{OH}$. Very different from the two foregoing, the NH_3 produced being quite negligible. (4) NH_2OH subjected to heat without the addn. of any $\text{M}(\text{OH})_2$. Two possible reactions are mentioned: (A) $3\text{NH}_2\text{OH} \rightarrow 3\text{H}_2\text{O} + \text{NH}_3 + \text{N}_2$. (B) $4\text{NH}_2\text{OH} \rightarrow 3\text{H}_2\text{O} + 2\text{NH}_3 + \text{N}_2\text{O}$ (cf. Haber's $\text{NH}_2\text{OH} \rightleftharpoons \text{O}:\text{N}(\text{H})_2$). Equation A requires 8.15% and B 12.23% NH_3 of the $\text{NH}_2\text{OH} \cdot \text{HCl}$ used. The KOH in the solns. used ranged from 3 to 29%. With the lowest concn. of KOH there was 2% NH_3 and with the highest 8.24%, i. e., following A. (5) RCH_2NHOH , hydrolysis in concd. HCl and KOH. The NH_3 produced ranged from 73 to 75 % of that calcd. (R representing Me, Et, and Pr). (6) *iso*- $\text{PrNHOH} + \text{Br}_2$. The following chain is indicated but the evidence is not complete; $\text{Me}_2\text{CHNOH} \rightarrow \text{Me}_2\text{CHNBrOH} \rightarrow \text{Me}_2\text{CHNO} \rightarrow \text{Me}_2\text{C}:\text{NOH}$. (7) $\text{EtNHOH} \cdot \text{HCl}$. Long colorless hygroscopic crystals, m. 37° . There was considerable difficulty in obtaining crystals from the oil. In some instances there would ultimately be spontaneous crystn. in the desiccator. In attempting to induce crystn. by planting crystals of other substances success followed the addition of crystals of $o\text{-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{NHOH} \cdot \text{HCl}$.

A. R. ROSE

The acids of montan wax. HANS TROPSCH AND A. KREUTZER. *Brennstoff Chem.* 3, 49 (1922).—Crude montanic acid was esterified with MeOH and the ester distd. at 5 mm. A fraction b. $265\text{--}7.5^{\circ}$ contained an acid $\text{C}_{27}\text{H}_{54}\text{O}_2$, crystg. from EtOAc in clumps of needles, which appeared like a twig of fir under the microscope, m. 82° . It is apparently identical with an acid isolated by Gascard from Chinese wax, and is given the name *carbuceric acid*. The fraction of the esters b. $277.5\text{--}70^{\circ}$ contains the true montanic acid, $\text{C}_{27}\text{H}_{54}\text{O}_2$, m. $86\text{--}6.5^{\circ}$.

W. B. V.

The preparation of esters by distillation of a mixture of an organic acid and an alcohol. H. WUYTS AND R. BAILLEUX. *Bull. soc. chim. Belg.* 29, 55-67 (1920).—The process of esterification is so conducted at the ordinary pressure, or under reduced pressure at such a temp. that only a portion of the products or one of the reacting substances is volatile. Two cases may occur, namely, (1) in which the ester is the most volatile component, (2) in which water and alc. are the most volatile components and the org. acid the least volatile. In the first case, the ester distils off as formed, although the problem may be rendered more complex by the eventual formation of binary or ternary mixts. with low b. ps., which may facilitate the sepn. or render it more difficult. In the second case, it has been possible by this method to prep. esters which have previously had to be prepd. from their components by heating them together in sealed tubes. In many cases, it is desirable to use *p*- $\text{MeC}_6\text{H}_4\text{SO}_3\text{H}$ as a catalyst. Numerous examples are given of esterifications by this method.

J. C. S.

The action of hydrogen peroxide on nitriles and on amides: the formation of hydroxamic acids. E. OLIVERI-MANDALA. *Gazz. chim. ital.* 52, I, 107-12(1922). Radziszewski (*Ber.* 18, 355(1885)) obtained RCONH_2 from RCN with H_2O_2 and Dubsky (*C. A.* 10, 2714) used this reaction as a method of sapon. O.-M. observed that in slightly alk. soln. with perhydrol the reaction goes farther thus: $\text{RCN} + 3\text{H}_2\text{O}_2 \longrightarrow (\text{RCO}_2\text{H} + \text{NH}_3) + \text{H}_2\text{O} + 3\text{O}$. If with aromatic nitriles a few drops of FeCl_3 soln. are added the cherry-red color characteristic of hydroxamic acids is obtained. This oxidation may be represented thus: $\text{RCONH}_2 \longrightarrow \text{RCON}(\text{O})\text{H}_2 \longrightarrow \text{RCONHOH}$ or $\text{RC}(\text{:NH})\text{OH} \longrightarrow \text{RC}[\text{N}(\text{O})\text{H}]\text{OH} \longrightarrow \text{RC}(\text{NOH})\text{OH}$, depending on the structure of the amide used. Vorländer (*Ann.* 345, 258(1906)) found amides resistant to oxidation in alk. soln. while in acid soln. they were more easily oxidized than amines, and he ascribed this property to the tendency of the amide and imide N to become 5-valent by adding O. O.-M. only succeeded in obtaining hydroxamic acids from amides with $\text{H}_2\text{O}_2 + \text{FeCl}_3$. 0.5 g. BzNH_2 , phthalimide and toluamide, in 100 cc. $\text{EtOH} +$ a few drops of FeCl_3 soln. and 1 cc. or more perhydrol, all gave the hydroxamic acids but expts. with AcNH_2 , EtCONH_2 and oxamide failed. The reaction is over when the cherry-red color is at its max. If allowed to react longer the corresponding CO_2H acid is obtained. Oximes with Caro's reagent (*Ber.* 36, 710(1903)), besides hydroxamic acids, give the nitric acid $\text{RC}(\text{OH})\text{NOH}$ and RCHNOH , and Bamberger obtained PhCHNOH from PhCH_2NH_2 with the same reagent. O.-M. found that both acetoxime and benzaldoxime with Caro's reagent as well as with $\text{H}_2\text{O}_2 + \text{FeCl}_3$ as above give the corresponding hydroxamic acids, while only aromatic amides are oxidized to give hydroxamic acids. In the last 2 pages the constitution of hydroxamic acids is discussed. O.-M. concludes that the free acids have the constitution RCONHOH or $\text{RCH.N}(\text{OH})\text{O}$

(*C. A.* 5, 1091) while the salts may have the oximic constitution. E. J. W.

The behavior of acid azides. E. OLIVERI-MANDALA. *Gazz. chim. ital.* 52, I, 101-6(1922).—The azides of org. acids heated in indifferent solvents (Schroeter, *C. A.* 3, 2555) decomp., giving N_2 , thus: $\text{RCON}_3 \longrightarrow \text{RCON} \longrightarrow \text{RNCO}$. The latter with HN_3 gives the azides of the carbamic acids (A), RNHCN_3 (O.-M. and Noto, *C. A.* 7, 2934). The reaction of ketenes with HN_3 , giving $\text{R}_2\text{CHNHCON}_3$ (B) (O.-M. and Calderaro, *C. A.* 7, 3755), probably has the same mechanism. The formation of A is a reversible reaction: $\text{RNCO} + \text{HN}_3 \longrightarrow \text{A}$, as may be shown by adding to A in C_6H_6 a substance that combines with HN_3 quickly, such as PhNC , which with HN_3 gives *N*-phenyltetrazole (O.-M. and Alagna, *C. A.* 5, 3571). The azides of thiocarbamic acid (C), RNHCSN_3 , lose an atom of S and N₂ on heating in indifferent solvents, giving RNHCN as polymers (*C. A.* 9, 71). Tetrazoles are obtained directly from C in this way. O.-M. attempted to obtain *N*-methylaminotetrazole (D) from the Me ester of HNCS (E) + HN_3 . E should give methylcyanamide, which in its nitrilic structure adds HN_3 , giving 1st $\text{MeN}:\text{C}(\text{N}_2)\text{NH}_2$ and this D. 10 g. E was added to 15 g. HN_3 in cold EtOH to obtain MeNHCN . Aq. HN_3 in excess was added and the mixt. heated some hrs. on the H_2O bath. N_2 was evolved and S pptd. On evap. *in vacuo* there sepd. small needles, m. 218° , of what is probably D, and will be studied further. O.-M. was interested to see if in Schroeter's reaction: $\text{RCOCl} + \text{NaN}_3 \longrightarrow \text{NaCl} + \text{RCON}_3$, the RCOCl could be replaced by NOCl to give nitroazide ($\text{O}:\text{N.N.N}:\text{N}:\text{O}:\text{N}:\text{N}:\text{N}$ or $\text{N}:\text{N}:\text{N}:\text{N}:\text{O}:\text{N}:\text{N}:\text{N}$). ONN_3 is intermediate in the reaction $\text{HNO}_2 + \text{HN}_3$

$\longrightarrow \text{H}_2\text{O} + \text{N}_2\text{O} + \text{N}_2$ (*C. A.* 15, 3039) in which it decomp., giving $\text{N}_2\text{O} + \text{N}_2$. NOCl in Et_2O agitated with finely divided NaN_3 evolved gas violently and the Et_2O boiled if concd. solns. of NOCl were used. When the mixt. was cooled the reaction ceased. The gas was collected in a Schiff azotometer filled with KOH soln.; the air was washed

out of the app. with CO_2 and the NOCl soln. was then added from a dropping funnel. The gas obtained was transferred to a Dreschmidt explosion app., mixed with excess H_2 and exploded. The results showed equimol. amts. of N_2 and N_2O as required by the reaction $\text{ONN}_2 \rightarrow \text{N}_2\text{O} + \text{N}_2$.

E. J. WITZEMANN

The action of carbon disulfide on mercuric acetate. A. BERNARDI AND G. ROSSI. *Gass. chim. ital.* 52, I, 139-40(1922).—Sidot (*Compt. rend.* 74, 179(1872); 81, 32(1875)) showed that CS_2 decomps. in sunlight, giving S and C protosulfide. B. and R. wished to know if this nascent S could react with metallic compds. and selected $\text{Hg}(\text{OAc})_2$ for the test. Cold aq. satd. $\text{Hg}(\text{OAc})_2$ was mixed with an equal vol. of CS_2 and placed in sealed flasks. Some were kept in the dark and some in sunlight. In both cases a cryst. crust of $\text{S}(\text{HgOAc})_2$ (A), m. 215° (decompr.), was formed probably thus: $\text{CS}_2 + 2\text{Hg}(\text{OAc})_2 + \text{H}_2\text{O} \rightarrow \text{S}(\text{HgOAc})_2 + \text{COS} + 2\text{AcOH}$. The COS was not detected. A is insol. in all solvents and is decomposed in inorg. acids and so the formation of other salts of the cation SHg_2^{++} is undetd. Analogous salts of other metals have not been obtained and it may be that Hg shows a special behavior in this case similar to its action in Hg-organic compds.

E. J. WITZEMANN

The products of condensation of carbamide and formaldehyde. MARC VAN LAER. *Bull. soc. chim. Belg.* 28, 381-92(1919).—The condensation of CH_2O and carbamide is much more complex and varied than are the condensations of CH_2O with amines or NH_3 acids. At the ordinary temp. the condensation affects the two amide groups, a sym. methylenic deriv. being obtained, which then tautomerizes, giving an asym. deriv., $\text{NH}_2\text{CON}:\text{CH}_2$, or its hydrate. Under other conditions, the change may be more complex, involving both the amide and the aldehyde H. This occurs if the temp. is raised or the carbamide is replaced by $\text{CO}(\text{NHMe})_2$, and under these conditions, according to the relative amts. of the two reagents used, insol. bases with high mol. wts. are formed, having the constitution of methylenic tricarbitimides of the type $\text{C}_{12}\text{H}_{10}\text{O}_4\text{N}_4$ or $(\text{C}_{10}\text{H}_{10}\text{O}_4\text{N}_4)_2$ or $(\text{C}_{14}\text{H}_{12}\text{O}_7\text{N}_4)_2$.

J. C. S.

Chlorourea. Preparation of chlorohydrins by action on ethylenic hydrocarbons. ANDRÉ DETOUFE. *Bull. soc. chim.* 31, 169-176, 176-81(1922).—D. has previously shown (cf. C. A. 16, 1395) that chlorourea in slightly acid soln. is a convenient source of HOCl for addition to unsatd. hydrocarbons. The method is here applied to the formation of a no. of chlorohydrins from the corresponding unsatd. hydrocarbons. $\text{Me}_2\text{C}(\text{OH})\text{CHClMe}$, obtained in 70 % yield, the reaction being rapid, gives $\text{Me}_2\text{C}:\text{CClMe}$ on warming with $(\text{CO}_2\text{H})_2$, $\text{Me}_2\text{C}:\text{O}:\text{CHMe}$ by the action of KOH and iso-PrCOMe

by the action of PhNH_2 ; BaCO_3 in H_2O gives the glycol. $\text{Me}_2\text{C}(\text{OH})\text{CClMe}_2$ is obtained in 67% yield; KOH in Et_2O gives 88% $\text{Me}_2\text{C}:\text{O}:\text{CMe}_2$ which gives $[\text{C}(\text{OH})\text{Me}_2]_2$

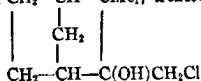
and no $\text{Me}_2\text{CCH}(\text{OH})\text{Me}$, showing the absence of an isomeric chlorohydrin in the first product. $\text{PrCH}(\text{OH})\text{CHClMe}$ is obtained in 60% yield, the reaction being slow; when oxidized it gives a ketone which does not combine with NaHSO_3 (probably PrCOCHClMe ; with KOH it gives $\text{PrCH}:\text{O}:\text{CHMe}$, with BaCO_3 in H_2O the glycol. The following

new monochlorohydrins were prepd.: Isoheptyleneglycol, iso- $\text{PrCH}_2\text{CH}_2\text{CH}(\text{OH})\text{CH}_2\text{Cl}$, b_m 97-98°, d_4 1.044, n_D 1.45662, in 85% yield from iso- $\text{PrCH}_2\text{CH}_2\text{CH}:\text{CH}_2$; oxidized, it gives iso- $\text{PrCH}_2\text{CH}_2\text{COCH}_2\text{Cl}$, which combines with NaHSO_3 ; NaOEt gives the corresponding ether; KOH gives iso- $\text{PrCH}_2\text{CH}_2\text{CH}:\text{O}:\text{CH}_2$. Octyleneglycol, $\text{BuCH}_2\text{CH}(\text{OH})\text{CHClMe}$, b_m 99-110°, d_4 1.001, n_D 1.45232, in 50% yield from $\text{BuCH}_2\text{CH}:\text{CHMe}$, b_m 125°, d_4 0.741, n_D 1.41456, prepd. from $\text{MeCHIC}_4\text{H}_9$; oxidized it gives α -chloromethyl hexyl ketone, b_m 92° (semicarbazone, m. 145°), does not combine with NaHSO_3 ; KOH gives octylene oxide, $\text{BuCH}_2\text{C}:\text{O}:\text{CHMe}$, b_m 70-75°, d_4 0.858, n_D 1.42085; this

CHClMe , b_m 99-110°, d_4 1.001, n_D 1.45232, in 50% yield from $\text{BuCH}_2\text{CH}:\text{CHMe}$, b_m 125°, d_4 0.741, n_D 1.41456, prepd. from $\text{MeCHIC}_4\text{H}_9$; oxidized it gives α -chloromethyl hexyl ketone, b_m 92° (semicarbazone, m. 145°), does not combine with NaHSO_3 ; KOH gives octylene oxide, $\text{BuCH}_2\text{C}:\text{O}:\text{CHMe}$, b_m 70-75°, d_4 0.858, n_D 1.42085; this

distd. at 760 mm. is partially transformed into $\text{MeCOC}_6\text{H}_{11}$; BaCO_3 in H_2O and NaOEt gives the same oxide; PhNH_2 gives the ketone; to confirm the structure of the chloroketone β -chloromethyl hexyl ketone, b_{15} 85–90°, m. ca. 25° (semicarbazone m. 133°), was prepd. from $\text{MeCOC}_6\text{H}_{11}$ and monochlorourea and found to be different in phys. and chem. properties. Styreneglycol, $\text{PhCH}(\text{OH})\text{CH}_2\text{Cl}$, b_{17} 128°, d_4 1.225, n_D 1.55405, in 70% yield from $\text{PhCH}:\text{CH}_2$; oxidized it gives PhCOCH_2Cl , identified by the m. p. of the semicarbazone; KOH gives PhCH.O.CH_2 ; NaOEt gives styreneglycol ethyl

ether, $\text{PhCH}(\text{OH})\text{CH}_2\text{OEt}$, $b.$ 240–245°, d_4 1.054. Cyclohexeneglycol, $\text{C}_6\text{H}_{11}\text{OCl}$, b_{16} 84–85°, d_4 1.138, n_D 1.44097, in 54% yield; oxidized it gives α -chlorocyclohexanone; with KOH it gives cyclohexyl oxide. *p*-Menthene-4,7-glycol, $\text{C}_{10}\text{H}_{19}\text{OCl}$, b_{14} 120–125°, d_4 1.063, n_D 1.48422, in 40% yield from the corresponding hydrocarbon prepd. from hydroterpineol; the structure of this chlorohydrin was not detd.; at least two other products seemed to be formed. With KOH it gives menthyl oxide, $b.$ 180–185°. Campheneglycol, $\text{C}_{10}\text{H}_{18}\text{OCl}$, b_{14} 125–130°, m. 96°, in 80% yield from camphene in AcOH added slowly to the aq. monochlorourea; oxidized it gives α -chlorocamphor, a rearrangement of the ring apparently taking place; the absence of aldehydes or acids as a product of oxidation shows that the structure is $\text{CH}_2-\text{CH}-\text{CMe}_2$; treated with KOH it gives



camphenylic aldehyde. The following conclusions are drawn from this work. (A) In regard to the addition of HOCl : (1) when the C atoms of the double bond are unequally substituted the OH attaches to the most substituted C atom; (2) when they are equally substituted, the OH attaches to the C atom the farthest from the end of the chain. (B) In regard to the loss of HCl from chlorohydrins: (1) if the medium is alk. and the temp. low, the oxide is obtained; (2) if the medium is alk. but the temp. sufficiently high the ketone is obtained in certain cases by intramol. change from the oxide; (3) if the medium tends to become acid by dissociation of the chloride which is formed (e. g., PhNH_2Cl when PhNH_2 is used to eliminate HCl) the ketone is obtained; (4) in neutral H_2O soln. the glycol is obtained. With cyclic hydrocarbons it is noted that the OH group attaches to the most substituted C atom, and the action of alkalies on the chlorohydrins gives oxides more stable than in the aliphatic series except in the case of camphene. J. B. C.

Dicyanamide. W. MAOELUNG AND E. KERN. *Ann.* 427, 1–26 (1922).—The following studies have for their purpose the relation between chem. constitution and electrochem. properties. Sodium dicyanamide is conveniently prepd. by adding solid BrCN to aq. Na_2NCN until the alk. reaction disappears. After filtering, the product is evapd. on the H_2O bath, and fractionally crystd. till free of NaBr . It forms fine needles, easily sol. in H_2O , less sol. in alc. Silver salt, flocculent ppt. on adding AgNO_3 to the Na salt, insol. in hot H_2O and HNO_3 , easily sol. in dil. NH_3 . Copper salt, blue-green, slightly sol. in hot H_2O and mineral acids, easily in NH_4OH with deep violet-blue color, which is characteristic, and of use in identifying the ions of $(\text{CN})_2\text{NH}$. SO_2 reduces this to the cuprous salt, colorless. Lead, mercuric and mercurous salts. Ammonium salt, fine needles, m. 116°, decomps. 126° (evolution of NH_3). Dicyanomethylamide results from $(\text{CN})_2\text{NAg}$ and MeI , quadratic crystals, m. 221°. Cond. measurements indicate that $(\text{CN})_2\text{NH}$ is a very strong acid. Boiled with concd. HCl, 2 mols. H_2O are added with the formation of biuret. Heating the Cu salt in NH_4OH at 150° transforms it into dicyanodiamide and biguanide. *o*-Ethylcyanoisourea, $\text{C}_8\text{H}_7\text{ON}_3$, was prepd. from CNNH_2 and BrCN or from $(\text{CN})_2\text{NNa}$ and alc. HCl, compact needles or prisms, m. 119°. The sodium salt forms needles, having a slight alk. reaction in H_2O .

When an excess of HCl gas is passed into an alc. suspension of $(\text{CN})_2\text{NNa}$, *o*-ethylbiurel is formed, m. 129°; hydrochloride, difficultly sol. needles. C. J. WEST

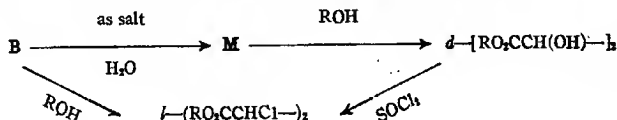
Tricyanomelamine. W. MADELUNG AND E. KERN. *Ann.* 427, 26-34 (1922).—Tricyanomelamine was prepd. by heating dry $(\text{CN})_2\text{NNa}$ over a free flame, by heating a mixt. of $\text{Hg}(\text{CN})_2$ and KCN and warming the product with dil. HNO_3 , or by heating $(\text{NCNH})_2\text{NH}$. The trisodium salt, $\text{C}_3\text{H}_3\text{N}_3\text{Na}_3\cdot 3\text{H}_2\text{O}$, is easily sol. in H_2O but very slightly sol. in alc. With AcOH this gives a monosodium salt, also with $3\text{H}_2\text{O}$, glistening needles, slightly sol. in H_2O . It has an acid reaction towards blue litmus. Trisilver salt; copper salt, light green needles; cuprous salt, colorless; lead, mercury, acid ammonium salts. The Ag salt and MeI give the trimethyl compound, needles, apparently decomp. somewhat at 215° and m. 268°. Cond. values are given. C. J. WEST

Condensation products from acid halides. IX. Ketenium compounds. E. WEDEKIND AND CL. WEINAND. *Ber.* 55B, 60-8 (1922); cf. C. A. 6, 490.—The "ketenium" compds. $\text{Me}_3\text{C}:\text{CO}:\text{NEt}_3$ and $\text{PhCCl}:\text{CO}:\text{NEt}_3$ formed by the action of NEt_3 on Me_3CHCOCl and PhCHClCOCl differ from Staudinger's ketene bases (2 mols. ketene + 1 mol. tertiary base) not only in the relative amts. of the components but also in that the basic component is aliphatic, while S.'s compds can be obtained only with cyclic tertiary bases (pyridine, collidine, quinoline, etc.). It seemed, therefore, that ketenes in the nascent state (formed by withdrawal of HCl from an acid chloride by an aliphatic tertiary base) are more reactive than when preformed. Another striking property of the "ketenium" compds. is their stability; they are not decompd. by even boiling dil. acids nor by alkalis and are almost unchanged by heating with H_2O under pressure; only when heated with concd. HCl under pressure do they decomp. smoothly into NEt_3 , HCl and $\text{Me}_3\text{CHCO}_2\text{H}$ or $\text{PhCH}(\text{OH})\text{CO}_2\text{H}$, resp. (the latter resulting from the hydrolysis of $\text{PhCHClCO}_2\text{H}$). The fact that one of these ketenium compds. is so easily obtained from a chlorinated acid chloride suggested a study of the action of NEt_3 on ClCH_2COCl . The reaction is extraordinarily violent; besides approx. the calcd. amt. of $\text{NEt}_3\cdot\text{HCl}$, there is formed a black amorphous mass together with a very small amt. of a liquid containing Cl and N which is doubtless chloroketene-triethylylum (A), $\text{ClCH}:\text{CO}:\text{NEt}_3$. In the reaction between NEt_3 and BrCH_2COCl , 25% more than the calcd. amt. of base is used up; besides a brown amorphous substance sol. in alkalis and repptd. by acids, there is formed bromoketene-triethylylum (B) in which the Br is held so firmly that it cannot be removed even with bot dil. alkalis; with HCl under pressure it gives quant. NEt_3 and $\text{BrCH}_2\text{CO}_2\text{H}$. The homologous α -Br aliphatic acid chlorides yielded similar substances containing Br and N, which, however, could not be purified. With Cl_2CHCOCl the reaction was extraordinarily violent and only by vigorously cooling and by dilg. was it possible to make it follow, to some extent, the desired course; the evolution of HCl was quant., the excess of base used up about 25%, and the main product again a dark amorphous product with only a very small amt. of dichloroketene-triethylylum (C). It was hoped that by replacing the two Cl atoms by O and simultaneously splitting off the NEt_3 a bimol. carbon monoxide (CO)₂ would be formed, whose formation would be shown by its spontaneous decompn. into CO; the quant. replacement of the Cl was in fact effected but there was no evolution of gas or of the odor of NEt_3 , the product being an amorphous N-containing acid substance of peculiar odor; boiling HCl extd. no NEt_3 . The above halogenated ketenium compds. are not adapted to catalytic hydrogenation with Pd, as the catalyst is quickly poisoned (probably by the halogen acid set free). $\text{Me}_3\text{C}:\text{CO}:\text{NEt}_3$ also poisons a Pd catalyst but with Willstätter-Löw's Pt black it takes up 2 atoms of H with relative ease and yields not a dihydro compd., but Me_3CHCHO and NEt_3 . The structure of the ketenium compds. is probably to be represented by a secondary valence formula $\text{R}_3\text{C}:\text{C}:\text{O}:\dots\text{NR}'_3$. A (1.5 g. from 97 g. NEt_3 and 68 g. ClCH_2COCl in 200 g. ligroin), b_p 120-5°. B (3.5 g. from 16 g. NEt_3

and 25 g. BrCH_2COCl in ligroin), b_D 128–9.5°. C (2.9 g. from 20 g. $\text{C}_6\text{H}_5\text{CHCOCl}$ and 15 g. NEt_3), b_D 142–50°.

C. A. R.

Stereochemical studies. V. Stereochemistry of the dichlorosuccinic acids. BROR HOLMBERG. *Arkiv. Kemi. Mineral. Geol.* 8, No. 2, 35 pp. (1920); cf. C. A. 6, 74; 7, 80; 8, 1280, 1576; 12, 807.—A more comprehensive study of *d*- (A), *l*- (B), *dl*- (C) and *meso*- α,β -dichlorosuccinic acid (D) is reported. D m. 217–8° (decompn.); soly. 3.17 g. per l. in $\text{EtOAc-C}_6\text{H}_6$ (1 : 9). The following acid salts of D were prepd. Potassium, contg. no H_2O of crystn. *meso-PhCHMeNH*₂ (G) m. 133–4°, soly. in H_2O 81.4 (all solubilities are in g. per l. at 25°). *d-PhCHMeNH*₂ (H) m. 128–9°, soly. in H_2O 76.4 g. per l. *l-PhCHMeNH*₂ (I) m. 128–9°, soly. in H_2O 76.1. D heated first in H_2O , with subsequent addn. of NaOH forms a mixt. of *meso*-[$\text{HO}_2\text{CCH}(\text{OH})$]₂ (J) in 57% yield and AcH. In acid soln. D is decompd. to *cis*- and *trans*- $\text{HO}_2\text{CCCCl:CHCO}_2\text{H}$. C m. 174–5° (decompn.), soly. in $\text{EtOAc-C}_6\text{H}_6$ 11.03. The following salts and esters of C were prepd. Acid potassium, contg. 2 H_2O . Neutral potassium, contg. 1 H_2O . Acid G, m. 149–50°, soly. in $\text{EtOAc-C}_6\text{H}_6$ 18.67. Dimethyl, from C, MeOH and concd. H_2SO_4 at room temp., m. 42–3° (cf. Darzens and Séjourné, C. A. 6, 2420). Diethyl, a liquid, decompd. by distn. *in vacuo*. Hydrolysis in H_2O of C forms chiefly *dl*-[$\text{HO}_2\text{CCH}(\text{OH})$]₂ (K) with H_2CO_3 and AcH. With acids or alkalies it forms *trans*- $\text{HO}_2\text{C-CCl:CHCO}_2\text{H}$ (L). A m. 166–7° (frothing), soly. in $\text{EtOAc-C}_6\text{H}_6$ 22.6. The following data show the solute, the solvent, the g. of solute, the vol. of soln., $[\alpha]_D^{20}$ and $[\text{M}]_D^{20}$ resp.: A, EtOAc 0.6455, 10.04, 79.8, 149.2; A, H_2O , 0.4746, 15.00, 3.6, 6.8; A, H_2O , 0.6155, 10.04, 2.3, 4.3; A, H_2O , 1.2264, 10.04, 1.1, 2.1; acid K salt of A, H_2O , 0.6093, 10.04, 7.9, 14.8; neutral K salt of A, H_2O , 0.6230, 10.04, 11.8, 22.0; A, *N* HCl, 1.0730, 15.00, –2.3, –4.3. The following salts of A were prepd. Acid potassium, contg. no H_2O of crystn. Neutral potassium, no H_2O of crystn. Acid H, m. 149–50°, soly. in H_2O 21.8. Acid I, m. 136–7°, soly. in H_2O 75.4. Diethylester, a liquid, d_4^{20} 1.239, $[\alpha]_D^{20}$ 55.0, $[\text{M}]_D^{20}$ 133.0. A with $\text{NH}_4\text{OH} + \text{NH}_4\text{Cl}$ forms L only. The Na salt of A heated with AgNO_3 forms H_2CO_3 , AcH, J and small amts. of K and *l*-[$\text{HO}_2\text{CCH}(\text{OH})$]₂. B m. 166–7° (decompn.), soly. in C_6H_6 22.5. The following data give the solvent, the g. of B, $[\alpha]_D^{20}$ and $[\text{M}]_D^{20}$ resp. when made up to 10.04 cc.: EtOAc , 0.6362, –79.5, –148.7; abs. EtOH , 0.6390, –71.0, –132.8; Me_2CO , 0.6202, –63.5, –118.7; H_2O , 0.6293, –2.1, –3.9. The following salts of B were prepd. Acid H, m. 167–7°, soly. in H_2O 75.8. Acid I, m. 147–8°, soly. in H_2O 21.8. Dimethyl ester, m. 64–5.5°, $[\alpha]_D^{17}$ –68.4 for 1.326 g. made up to 10.04 cc. with CHCl_3 . Hydrolysis in H_2O forms chiefly *d*-[$\text{HO}_2\text{CCH}(\text{OH})$]₂ (M) with some H_2CO_3 and AcH. Correlating this work with that of Frankland and Lea and of Darzens and Séjourné, the following relations are derived:



Whether no transposition of either C atom occurs or whether the Walden inversion of both C atoms takes place in the hydrolysis of A, as in the reaction of *d*-[$\text{RO}_2\text{CCH}(\text{OH})$]₂ with SOCl_2 , could not be detd. VI. Stereoisomeric trithiocarbodilactic acids. *Ibid* 8, No. 8, 17 pp. (1921).—Two isomeric acids of the compn. $(\text{HO}_2\text{CCHMeS})_2\text{CS}$ are formed by the reaction of α -bromopropionates and K_2CS_2 (cf. *J. prakt. Chem.* [2] 71, 293 (1905)), one crystals, the other an oil. Decompn. of the cryst. form by the active forms of PhCHMeNH_2 (A) yields the active trithiocarbodilactic acids. A further study is made of the *meso*- (B), *dl*- (C), *d*- (D) and *l*-forms (E). B purified from its

neutral Ba salt and crystd. from H_2O yields yellow prisms, m. $104-5^\circ$, soly. in H_2O 27.4. *Barium salt*, flat yellow prisms with $5H_2O$, easily sol. in H_2O . Neither the $PhNH_2$, nor the A salt could be prepd. Heating B with $PhNH_2$ in H_2O forms *N*-phenyl- β -methoxyrhodanine and with *d*- $PhMeCHNH_2$ (G) forms *l*-($PhMeCHNH_2$) $_2$ CS. C crystd. from dil. EtOH or Me_2CO yields small yellow prisms, m. $154-5^\circ$, soly. in H_2O 3.03. *Barium salt*, contg. $4H_2O$, sol. in H_2O . *Aniline salt*, m. 135° (decompn.), reacts with F like B. D from C and G, small yellow prisms from H_2O or EtOH, m. $136-6.5^\circ$, soly. in H_2O 10.6. The following data give the solute, solvent, $[\alpha]_D^{20}$ and $[M]_D^{20}$ for 0.6 g. in 10 cc.: D, Me_2CO , 167.4, 426; G, abs. EtOH, 186.1, 422; D, EtOAc, 187.9, 478; acid Na salt of C, H_2O , 50.6, 129. C prepd. like D had the same m. p. and soly. For 0.6 g. in 10 cc. of Me_2CO $[\alpha]_D^{20}$ and $[M]_D^{20}$ were resp.: $-167.8, -427$; for 0.2 g. in 22 cc. of H_2O , $-109, -276$. Heated in H_2O E is slowly rendered inactive. D heated with NH_4OH forms $MeCH(SH)CO_2H$, which is oxidized to *d*-($HO_2CCHMeS-$) $_2$ (cf. *J. prakt. Chem.* [2] 78, 63(1908)). C. C. DAVIS

C₁₄ fatty acids. IV. A rearrangement of the benzilic acid type in the aliphatic series. BEN H. NICOLET AND ALFRED E. JURIST. *J. Am. Chem. Soc.* 44, 1136-41 (1922); cf. C. A. 16, 1565.—Le Sueur found that when 9,10-dihydroxystearic acid (A) is fused with KOH, the principal reaction consists in the formation of α -hydroxy- α -octylsebacic acid (B), $Me(CH_2)_8C(OH)(CO_2H)CH_2(CH_2)_8CO_2H$. To det. whether diketostearic acid (C) (obtained from A with CrO_3) is an intermediate product in the reaction, C was fused with KOH at 160° , 190° and 225° . Only at 160° could A and B be isolated, so the reactions at the higher temps. were not studied further. Azelaic (D) and pelargonic acids (E) also were obtained. As H is not evolved in the action of KOH on C, the formation of A can be readily explained only on the basis of an intermol. oxidation and reduction similar to the Cannizzaro reaction. By analogy it would be expected that for each mol. of A 2 mols. each of D and E would be formed. No C is recoverable after the fusion. For each g. of A formed were isolated 0.36 and 0.54 g. D and E, resp. (calcd. for 2 mols., 1.19 and 1.0 g.), and B was obtained in 11.86% yield; this is interpreted as meaning that, simultaneously with the intermol. reduction and oxidation to A, D and E, C has undergone a benzilic acid rearrangement to B. As much of the original material remained unaccounted for and products were obtained which could not be distd. even under a high vacuum, the formation of a complex quinone according to von Pechmann (*Ber.* 21, 1411(1888)) is not excluded. That the presence of B is due to the intermediate formation of A is doubtful, for A with KOH at 160° or 190° is practically unchanged, and the concn. of A formed in these reactions is relatively small. Consequently, it is believed that C is an intermediate product in Le S.'s reaction; the relatively small yield obtained from C by N. and J. can be explained by the relatively large concn. of A used and the H evolved under Le S.'s conditions tending to prevent the formation of D and E, and the condensation of the C to form quinone derivs. according to von P. (suspected but not actually demonstrated) is a bimol. reaction with respect to C and its rate is accordingly proportional to the square of the concn. of C, so that it makes an enormous difference whether C is the starting material or merely an intermediate product. The C, m. 86° , was obtained in 25% yield from A in AcOH at 20° with CrO_3 and a little H_2SO_4 ; *methyl ester*, similarly obtained in 25% yield from the Me ester of A, m. 55° ; *ethyl ester* (15% yield), yellow needles, m. 50° .

V. Molecular rearrangements in some derivatives of unsaturated higher fatty acids. BEN H. NICOLET AND JOSEPH J. FELC. *Ibid.* 1145-9.—The rearrangements characteristic of hydroxamic acids and their derivs. take place, in general, normally for the derivs. of oleic, elaidic and ricinoleic acid but certain abnormal and rather surprising results also are obtained. The Lossen rearrangement to ureas and that of Lengfeld-Schlagler to urethans were obtained in every case but oleo-(A) and elaidohydroxamic acids

(B) heated with excess of Ac_2O gave in both cases a mixt. of *cis*- and *trans*-heptadecenyl isocyanates; the urethans under the same conditions showed no tendency to rearrange to form geometrical isomers. The following hydroxamic acids were prepd.: A, prepd. from $\text{NH}_4\text{OH} \cdot \text{HCl}$ and NaOH refluxed in alc. with Et oleate; B, from Et elaidate, sepd. from alc. in flakes m. 86° ; ricinoleo, flakes from Et_2O , m. 65° ; linoleo, m. $8-10^\circ$, darkens and resinifies on standing; oleoacetyl (C), crystals from alc., m. 63° ; elaidoacetyl (D), silvery flakes from alc., m. 84° ; λ -acetylricinoleoacetyl (E), oil, m. $6-8^\circ$; oleodiacetyl, plates from alc., m. $64-5^\circ$; elaidodiacetyl, m. 82° . Di-*trans*-heptadecenylurea, from C by the Lossen rearrangement, needles from CHCl_3 , m. 59° ; *cis*-isomer, from D, m. $92-3^\circ$. Di[hydroxyheptadecenyl]urea, from E, crystals from alc., m. 57.5° . *trans*-Heptadecenylurethan, from C by the Lengfeld-Stieglitz rearrangement, crystals from ligroin, m. $42-3^\circ$; *cis*-isomer, m. $87-8^\circ$. The mixt. of isocyanates obtained from A or B in Me_2CO with Ac_2O could not be sepd. into its components but with warm alc. gave the above urethans and with an excess of PhNH_2 2 substances, m. $72-3^\circ$ and $83-4^\circ$, which were undoubtedly the *trans*- and *cis*-heptadecenylphenylureas. C. A. R.

Pyrimidines. XCIII. Ferrous hydroxide peroxide. II. A new method of identifying thymine. OSKAR BAUDISCH AND TREAT B. JOHNSON. *Ber.* 55B, 18-21 (1922); cf. C. A. 16, 1215. C. A. R.

The influence of sodium chloride on the mutarotation of dextrose in alkaline solution. H. MURSCHHAUSER. *Biochem. Z.* 128, 215-28(1922); cf. C. A. 16, 1081.—A detailed tabular report of the effect of various concns. of NaCl on the mutarotation of dextrose in various concns. of Na_2CO_3 soln. The results show that no conclusion can be drawn of the combined effect of acids or bases plus neutral salt on mutarotation from the knowledge of the action of a certain amt. of acid or base and NaCl. HCl and Na_2CO_3 increase the rate of mutarotation, NaCl in H_2O soln. acts as a retardant. The addn. of NaCl to 0.361% HCl increases the acceleration proportionally to the NaCl concn. The addn. of NaCl to 0.0005 N Na_2CO_3 retards the velocity proportionally to the sq. root of the NaCl concn. If the OH ion concn. is doubled, the retardant effect of the same amt. of NaCl is also doubled. F. S. HAMMETT

The influence of sodium chloride on the mutarotation of dextrose in hydrochloric acid solution. II. H. MURSCHHAUSER. *Biochem. Z.* 128, 229-44(1922); cf. C. A. 16, 1745.—By a comparison of the consts. of the reaction under various conditions H. finds that the influence of acid on the course of mutarotation of dextrose in NaCl solns. of definite concns. consists in a linear acceleration of the process with increasing HCl concn. This is much greater than that which occurs in H_2O soln. The cause of the NaCl action is as yet an unsolved problem. F. S. HAMMETT

The unsaturated reduction products of the sugars and their transformations. III. 2-Desoxyglucose (glucodesose). MAX BERGMANN, HERBERT SCHOTTE AND WOLFGANG LECHINSKY. *Ber.* 55B, 158-72(1922); cf. C. A. 15, 3626.—The formation of glucosides, at least by the imperfect methods of the lab., is an astonishingly complicated process and quite different parts of the individual sugar mols. take part in the reaction; so, in order to study the mechanism of the process, it becomes necessary to pick out individual structural elements and investigate their influence on the course of the reaction. This is best effected by removing the group in question from the sugar mol. and subjecting the residue to the usual conditions for glucoside formation and cleavage. For this and other purposes it was undertaken to prep. a sugar differing from glucose in that the HO group on C atom 2 had been removed. Glucal, treated with acids under the proper conditions, yields a hydrate, 2-desoxyglycose (A), $\text{HOCH}_2\text{CH}(\text{OH})\text{CH}_2\text{CH}(\text{OH})\text{CH}_2\text{CH}(\text{OH})\text{O}$ (previously obtained only as the benzylphenylhydrazone),

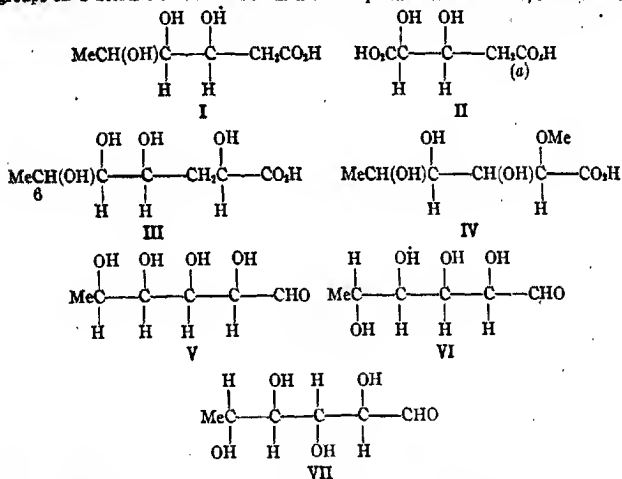
which behaves towards Fehling soln., alk. AgNO_3 and fuchsin- SO_2 like glucose, is al-

tered and turned yellow by hot alkalis and is characterized by its sensitiveness to acids, which, when not too dil., on heating rapidly decomp. it with deposition of gray-green or dark amorphous substances of a peculiar bumus-like odor, a reaction which can be used to detect A and distinguish it from true sugars. The same is true of the green color which A imparts to a pine splinter subsequently exposed to HCl gas. These 2 reactions probably hold not only for A but also for other 2-desoxy sugars. A is characterized from all other sugars thus far investigated by the ease with which it is converted into glucosidal derivs. by alcs. in the presence of acids; small amts. of AcOH suffice to produce a glucoside at 100° in a short time and in MeOH containing 0.25–1.0% HCl the reaction is complete in 15 min. at room temp. The resulting *methyl α -2-desoxyglucoside* (B), m. 91–2°, $[\alpha]_D^{138}$, differs in m. p. and in its *d*-rotation from that (β -form) previously described (C) (m. 122–3°, $[\alpha]_D^{138}$ –48.2°), the difference in rotation between the 2 isomers (189)° being exactly the same as that between α - and β -Me glucosides. B and C probably stand in the same relation to each other as the 2 glucose derivs.; the sensitivity of each towards acid hydrolytic agents is very similar but considerably greater than that of the glucose derivs., B and C thus approaching in behavior the so-called unstable glucosides of the type of Fischer's γ -Me glucoside. The absence of a HO group on the 2-C atom, therefore, greatly favors the glucoside cleavage. The free A itself was also obtained in 2 forms with entirely different rotations but mutarotation in aq. soln. was not observed. Ordinary brewer's yeast does not attack A, nor do a number of pure yeast cultures; apparently O on C atom 2 is essential for fermentation. Neither B nor C is hydrolyzed by yeast or emulsin. Kiliani's digitoxose (D) shows the same behavior towards acids and gives the same pine splinter test as A and probably belongs to the same class of substances. One might be inclined still to designate compds. like A and D as sugars, and it seems best to B., S. and L., in detg. whether a substance is to be called a sugar, to use as criteria, along with the usual reactions with alkalis, reducing agents, etc., the ability to form cyclic mixed acetals (glucosides) and osazones. HOCH_2CHO , which can form typical glucosides (cf. C. A. 16, 1081), is therefore considered as the simplest sugar and the simple sugars are defined as aldehyde alcs. and ketone alcs. with an open C chain and one or more HO groups, at least one of which is directly adjacent to the C : O group. A and D are, therefore, no longer true sugars; in future, in place of the cumbersome designation 2-desoxysugar, it is proposed to designate such sugars by inserting between the root word of the parent sugar and the characteristic ending, *ose*, of all sugars the syllable *des*; A thus becomes *glucodesose*. A, from pure glucal (obtained by hydrolyzing the tri-Ac deriv. with NH_3 in MeOH) allowed to stand 8 hrs. at 0° in 2 N H_2SO_4 , shows $[\alpha]_D^{15}$ 46.59° (H_2O), 17.56° ($\text{C}_5\text{H}_5\text{N}$), tastes very faintly but pleasantly sweet, m. turbid 148°, foams about 155°; 1 g. in 1% soln. reduces about 200 cc. of Fehling soln.; in the Wüllstätter and Schubel titration it consumes in 20 min. the amt. of I calcd. for oxidation to glucodesonic acid; it decolorizes Br only slowly (0.9 mol. after 14.5 hrs. at 20°); concd. H_2SO_4 instantly carbonizes it; with AcOH- H_2SO_4 containing Fe it does not give the blue color reaction of D but a brown-black ring. It can be obtained as the benzylphenylhydrazone, m. 158–9°, $[\alpha]_D^{15}$ 8.7° (0.6% soln. in MeOH), in 20% yield directly from triacetylglucal in 2 N H_2SO_4 at 10–5° after 2 days; 5 g. of the hydrazone in 50 cc. H_2O refluxed 2 hrs. with 4 g. BzH and 0.4 g. BzOH gives 70% of the free A. *Methylphenylhydrazone*, fine needles or prisms from AcOEt, m. 157–8°, decomp. about 195°. *p*-Nitrophenylhydrazone, canary-yellow prisms from alc., m. 190–1° (decompn.). B (5.8 g. from 10 g. A boiled 15 min. with 150 cc. MeOH containing 0.25% HCl or allowed to stand 15 min. at room temp.; in 1% acid), elongated 6-cornered tables or slender prisms from AcOEt-petr. ether, does not reduce Fehling soln. or NH_3 -AgNO₃, hardly adds Br in CHCl_3 , is instantly decompd. by hot 5 N HCl, gives only a very faint green pine-splinter test, dissolves

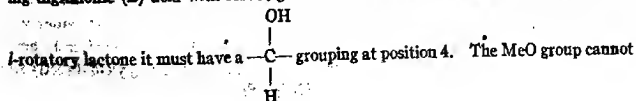
in boiling concd. alkali without discoloration, is hydrolyzed 95% in 5 min., 100% in 10 min. by 0.1 *N* HCl at 100°, 69, 79 and 98% in 15, 30 and 60 min. by 0.01 *N* HCl, not measurably in 4 hrs. by 0.001 *N* HCl; C shows about the same hydrolysis velocity. *Tetrabenzoylglucosazone* (1.5 g. from 1 g. A in 2.9 g. cold C_6H_5N treated slowly with 4.3 g. $BzCl$ in a little $CHCl_3$ and allowed to stand 24 hrs.), rectangular tables or short broad prisms from alc., m. 136–45°, is apparently a mixt. of isomers. C. A. R.

New (observations) in the chemistry of the sugars. II. H. KILIANI. *Bpt.* 55B, 75–101 (1922); cf. C. A. 15, 2424.—The opinion expressed in the earlier paper that in the oxidation of sugars and the corresponding poly-HO acids with HNO_3 the exclusion of air might prove advantageous has been confirmed; K. now uses conical flasks closed with a ground-glass 2-mm. exit tube bent down twice at right angles, the upward vertical end being 3, the horizontal portion 4 and the downward vertical end 1.5–2 cm. long, or conical flasks with ground-glass stoppers can be used with a thin, narrow roll of long-fibered glass wool between the stopper and the mouth of the flask. Although in this improved form the new oxidation method renders excellent service for many purposes, it fails in K.'s original chief aim—the prepn. of the analogs of glucuronic acid (A) in large amts.—because, in the majority of cases thus far studied, there are formed, instead of aldehydic, ketonic acids, most probably with the C : O group in the 2- or α -position. This last assumption is supported by the following facts: The oxidation products are considerably more labile than A, gradually undergoing decompn., in sirup form, on simple standing in the air, finally becoming black, and losing CO_2 to some extent on boiling in H_2O ; when converted by addition of HCN and subsequent hydrolysis into the corresponding dibasic acids, the latter on boiling with a little H_2O lose still more CO_2 and prove to be malonic acid derivs., although 10–5 hrs. boiling of the concd. soln. does not suffice for the complete decompn. I. *d*-Glucose and *d*-gluconic acid + HNO_3 .—The strongly reducing acid obtained from *d*-glucose with HNO_3 is not A; its Ca salt forms granular crystals (that of A is amorphous) and the acid is much more labile than A. It is probably 2-keto-*d*-gluconic acid; attempts to prove this by splitting off CO_2 from the hydrolyzed cyanhydrin, which should give *d*-gluconic and *d*-mannonic acids, failed on account of the difficulty in smoothly splitting off the CO_2 quant.; an exact study of the keto acid is further impeded by the difficulty in sepg. it from the *d*-saccharic acid formed simultaneously and by the impossibility of removing the Ca from the difficultly sol. cryst. Ca salt with $(CO_2H)_2$ in the cold in the usual way. The same keto acid is obtained from *d*-gluconic acid. Its prepn. is described in detail. II. *Prepn. of rhammonic acid*.—In this case the old Br oxidation method (yield, 60–4%) is preferable to the HNO_3 method (yield, 30% at most). The oxidation of aldoses by Br is never quant.; the resulting acid soln. always contains a few % of the sugar which, in the case of the easily sol. acids and lactones, may considerably influence their ability to cryst. and, therefore, the yields; the acid soln., freed from HBr, should therefore be boiled with $CaCO_3$ (at least 45 min.), and concd. to a small vol., and the Ca salt pptd. with alc. and decompd. with the calcd. amt. of $(CO_2H)_2$. III. *Rhammonic acid and rhamnose + HNO_3* .—Rhammonic lactone (10 g. at a time at most) treated, for each g., with 2 cc. HNO_3 (d. 1.35) in 250–300 cc. cooling H_2O gives after 12–5 hrs. 46–57% of 2-ketorhammonic lactone, becomes discolored around 168°, m. about 188°, sol. in about 20 parts H_2O at 20°, $[\alpha]_D^{25.2}$ 6 hrs. after soln., does not react with fuchsin- SO_3 but does powerfully with Fehling soln., 0.096 g. being equiv. to 0.0915 g. glucose; *p*-nitrophenylhydrazone, long yellow needles with 1 H_2O , darkens 130°, m. about 150°, begins to sep. from a 1 : 100 soln. of the ketone in 1, from a 1 : 450 soln. in 6 min.; the finely powdered ketone in 7.5 parts H_2O is unchanged after 4 days by 2 atoms Br; with Ag_2O in H_2O after 14 hrs. at 50–5° it gives $AgOAc$. The same ketone is obtained in about 39.5% yield directly from rhamnose. IV. *α -Galactopionic acid + HNO_3* .—Since the configuration of Fischer's

α -galacteponic acid (B) has been established by Hudson (C. A. 11, 1426) the "aldehyde-galactonic lactone" obtained as a by-product (10%) in its oxidation with hot HNO_3 (Ber. 22, 1288), which is shown below really to be an "uronic acid," should be called *l-mannohepturonic lactone* (from *d*-galactose); it can be obtained in 49–65% yield of the B with 0.5 cc. HNO_3 (d. 1.35) per g. B at 14–22° in about 40 hrs., and reduces Fehling soln. very strongly, becomes discolored about 190°, softens 205–6°, $[\alpha]_D -195.8^\circ$, sol. in about 15 parts H_2O at room temp.; with Br and H_2O after 24 hrs. 59% is recovered unchanged and the mother liquors, neutralized with alkali and treated with $\text{Cd}(\text{NO}_3)_2$, yield only a moderate crop of the Cd salt of the dibasic acid formerly designated as "carboxygalactonic acid"; with 4.5 cc. HNO_3 (d. 1.2) per g. of the lactone at 60° in 2 days is obtained a much better yield of the Cd salt, further characterized by conversion into the acid K salt. This shows that the oxidation product of B is really an "uronic acid." V. Configuration of digitoxose and digitoxosecarboxylic acid.—Digitoxose is an aldose with a terminal Me group and yields no osazone; HNO_3 degrades it into a dihydroxyglutaric acid with mesotartaric acid as a by-product and therefore the HO groups on C atoms 3 and 4 must be in the meso-position to each other; furthermore,



since the lactone of digitoxinic acid is *l*-rotatory, by Hudson's rule digitoxinic acid must have the configuration I and the corresponding dihydroxyglutaric acid the configuration II, in which only the CO_2H group (a) can form a γ -lactone. The lactone of digitoxosecarboxylic acid (C) is likewise *l*-rotatory ($[\alpha]_D -13.67^\circ$), as is its phenylhydrazide (D), so the new HO group introduced through the cyanohydrin must likewise be placed above and C has the configuration III, in which only that of the 6-CHOH group remains to be detd. D m, 145–8°, $[\alpha]_D -37.7^\circ$. VI. Structure of digitalonic acid (and digitalose).—Digitalose is an aldose with a terminal Me group and oxidation of the corresponding digitalonic (E) acid with HNO_3 gives a methoxytriglutaric acid and as E forms a



be on C atom 5, for then the HNO_3 oxidation should split it off completely and yield a pure trihydroxyglutaric acid. If it is on C atom 3, the mother substance, digitalose (F), should give an osazone normally but not if the MeO group is on C atom 2.* From the combined sugar soln. obtained by hydrolysis of *Digitalinum verum*, which should contain 1 mol. each of glucose and F, only phenylglucosazone could be isolated, whence it is concluded that F forms no osazone and that E (its phenylhydrazide shows $[\alpha]_D$ about -16°) has the configuration IV and the mother substance of F is not ordinary rhamnose but isorhamnose (V, VI or VII of the 14 possible configurations).^c VII. *Salts of trihydroxyadipic acid from metasaccharin*.—The discovery that the new HNO_3 oxidation method leads to the formation of 2-ketonic acids explains why saccharin, contrary to iso- (G) and metasaccharin (H), is attacked at room temp. only by very concd. HNO_3 in spite of its terminal CH_2OH group and G, in spite of its 2 terminal CH_2OH groups, is attacked with greater difficulty than H. *Salts of trihydroxyadipic acid*: Ca, limit of precipitability from a soln. of the pure neutral alkali salt with approx. an equiv. of a 1 : 2 soln. of $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$; at a diln. of 1 : 50 crystn. begins in a few sec., at 1 : 200 in a few min., is slower but still distinct at 1 : 1,000; *strontium*, columns with 4 H_2O ; *magnesium*, crust with 3 H_2O ; Ba, voluminous amorphous ppt. from H_2O -EtOH; *dipotassium*, slender columns or needles with 1 H_2O ; Ag, can be obtained at a diln. of 1 : 400; *cadmium*, crust of columns with 2 H_2O ; *quinine*, needles with 6 H_2O . VIII. *Salts of l-trihydroxyglutaric acid*.—Ca, seps. immediately but not completely from a 1 : 10 soln. of the di-K salt with the calcd. amt. of a 1 : 2 soln. of $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$, almost completely from a 1 : 50 soln. of the K salt, a 1 : 2 soln. of $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ and 80 vol. % of alc. in 24 hrs.; *quinine*, long needles with 5 H_2O . IX. *Salts of α -galactopentapentoidicarboxylic acid*.—Cd, seps. at once from the di-K salt (1 : 70) with $\text{Cd}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ (1 : 2), overnight at a diln. of 1 : 118; Ba, seps. at once from the di-K salt (1 : 23.6) with $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ (1 : 4), overnight, after seeding, at a diln. of 1 : 70; *calcium*, seps. at once but incompletely from the di-K salt (1 : 23.6) and $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ (1 : 2). X. *Preparation of d-galactonic acid*.—A solid pulverizable material of approx. the compn. $\text{C}_6\text{H}_{12}\text{O}_7 \cdot 2\text{H}_2\text{O}$ (equiv. wt. found by titration with phenolphthalein, 227.5) is obtained by evap. the acid soln. (from the Ca salt + $(\text{CO}_2\text{H})_2$) in a shallow dish at $35-40^\circ$ to a thick magma, allowing to stand 1.5-2 days in a conical flask with 1.7 cc. of 85% alc. for each g. of the magma, washing with the minimum amt. of 85 and finally of 95% alc. and drying *in vacuo*; it m. 122° (Nef gives $140-2^\circ$ for $\text{C}_6\text{H}_{12}\text{O}_7 \cdot \text{C}_6\text{H}_{14}\text{O}_8$). XI. *Preparation of the galactopentonic acids*. The 2 acids were prepd. by a modification of the Fischer phenylhydrazide method. The α -lactone m. $145-7^\circ$, $[\alpha]_D -51^\circ$; phenylhydrazide, m. 220° . β -Phenylhydrazide, m. 185° ; free acid, m. 145° , gives on oxidation with HNO_3 like the α -lactone (above) a strongly reducing sirup, which, however, could not be made to cryst. XII. *Preparation of l-mannonic and l-gluconic acids*.—The prepn. of these acids from arabinose with HCN was improved; the gluconic acid is isolated from the mother liquors of the mannonic lactone through the *brucine salt*, crystals with 4 H_2O from 85% alc., m. 155° . C. A. R.

The constitution of polysaccharides. J. J. LIJNST ZWIKKER. *Rec. trav. chim.* 41, 152(1922).—A correction of a formula given in a previous paper (C. A. 16, 1216) which does not appear in the abstr. E. J. WITZEMANN.

The structure and formation of humic acids and coals. J. MARCUSSEON. *Z. angew. Chem.* 35, 165-6(1922); cf. C. A. 16, 411.—Humic acids are intermediate products between wood and coal. On the basis of their structure from furan derivs. they are polymerized *peri*-difurans. They dissolve in cold Na_2CO_3 with the elimination of CO_2 . By treatment with 3% alc. HCl esters are formed. On heating to 260° CO_2 as well as H_2O is given off. From an investigation of their cond. the acids may be considered as tri- or tetrahasic acids. In the formation of brown coal humic anhydrides

and humic ketones are formed. This takes place either by splitting off H_2O or by giving off CO_2 from the acids. Cellulose may be changed to humic acid and then to coal by first changing to lignin, or directly, either by hydrolysis or by the action of plant acids.

C. T. WHITE

Derivatives of suberone. MARCEL GONCHOT AND PIERRE BRUN. *Compt. rend.* 174, 618-20 (1922).—Cycloheptylidencycloheptanone (A), obtained by the action of CaH_2 on suberone, is a liquid with a slight mentholic odor, b_D^{20} 1.43-5°, d_4^{20} 0.9936, n_D^{20} 1.5144. Cycloheptylcycloheptanol (B), obtained by treating A with EtOH and Na, liquid, b_D^{20} 158-61° d_4^{20} 0.9908, n_D^{20} 1.5133. Steric hindrance prevents the formation of the phenylurethan of B or the semicarbazone of A but the allophanic ester of B is obtained by Béhal's method, white needles m. 183°. Dibromosuberone (C), obtained by slowly adding Br in CCl_4 to suberone in CCl_4 , long colorless needles, stable in the light, m. 68°. C treated with cold dil. NaOH gives a sirupy liquid, probably a cycloheptanediolone.

T. E. DUNLAP

A paraffin hydrocarbon contained in commercial benzene. JEAN TIMMERMANS. *Bull. soc. chim. Belg.* 29, 227-9 (1920).—A hydrocarbon consisting chiefly of heptane mixed with a small quantity of a C_7 -polymethylene was sepd. from com. benzene; the quantity of the hydrocarbon present is less than 0.3%, and it does not yield a sulfonic acid.

J. C. S.

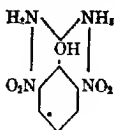
Influence of nitro groups on the reactivity of substituents in the benzene nucleus. VI. The elimination of halogen during the reduction of halogenated nitro compounds. HAROLD BURTON AND JAMES KENNER. *J. Chem. Soc.* 121, 675-82 (1922); cf. *C. A.* 16, 1944.—6-Iodo-*m*-toluidine, by reduction of 2,5-I(NO_2) C_6H_3Me , plates, m. 46°. *Hydrochloride*, needles; *acetate*, prisms, m. 147-8°. The conditions for reduction were: 23 g. $SnCl_4$ and 26.4 g. concd. HCl at 86.5° were treated with the soln. to be reduced at the rate of 5 cc. every 5 min. 10 g. of the $IC_6H_4NO_2$ or an equiv. amt. of the $I(O_2N)-C_6H_3Me$ were dissolved in 100 cc. abs. EtOH and 10 cc. H_2O . 5 min. after the last addn., the soln. was cooled, made up to 500 cc., an aliquot rendered strongly alk., extd. with Et_2O , the aq. soln. neutralized with H_2SO_4 , treated with $NaNO_2$ and the I removed by steam and estimated by Jannasch's method. The results are shown in the following table:

Orientation of substituent.			Nature of X.			
Me.	P.	X.	NO_2 .	NHOH.	NH_2 .	
-	2	4	0	trace	trace	
-	2	5	—	8.4	12.65	
-	2	3	4.9	14.8	21.5	
1	3	6	9.2	11.2	13.1	
1	2	5	19.5	33.6	36.1	
1	4	3	21.1	42.3	—	
1	2	3	42.5	57.9	64.2	

C. J. WEST

Reduction of certain aromatic nitro compounds by ammonium sulfide. A. KORCZYŃSKI AND S. PLASECKI. *Anz. Akad. Wiss. Krakau* 1917, 176-83.—The reduction of $sym-C_6H_4(NO_2)_2$ is influenced by the nature of the solvent used. With water or weaker alc. than described by Bader (*Ber.* 24, 1653-5 (1891)) as solvent, 5-nitro-*m*-phenylenediamine is obtained instead of dinitroaniline. The reaction shows a close connection with the formation of the additive product of $sym-C_6H_4(NO_2)_2$ with 2 mols. of NH_3 described by Korczyński (*C. A.* 3, 1519; 4, 1483) which is also formed as an intermediate product in the reduction with $(NH_4)_2S$. As in the reduction of 2,4,6-(O_2N) C_6H_3OH , 4,2,6- $O_2N(H_2N)_3C_6H_3OH$ is formed; the groups reduced are those which exert the greatest influence on the formation of the abnormal salt (cf. Korczyński, *loc. cit.*). Also

in the partial reduction of $2,4-(\text{O}_2\text{N})_2\text{C}_6\text{H}_3\text{CO}_2\text{H}$ the first NO_2 group to be reduced is the one in the *p*-position, which has the greatest influence in the formation of the abnormal salt, and not the one next to the acid group, as hitherto supposed. In aq. soln.; both groups are reduced by $(\text{NH}_4)_2\text{S}$. The connection between the formation of an abnormal salt and capability of reduction is explained by postulating (annexed formula) a mutual satisfaction of residual affinities between the NO_2 groups concerned and the groups in



the region of the activity of the acid H; in other words, the NH_2 mols. *5-Nitro-m-phenylenediamine*, obtained by gradual addn. of concd. aq. $(\text{NH}_4)_2\text{S}$ to boiling aq. $\text{sym-C}_6\text{H}_3(\text{NO}_2)_2$, crysts. in brownish red needles, m. 159° . The *dibromo derivative* forms brownish yellow scales, m. $183-4^\circ$. The *acetyl derivative* is almost insol. *5-Nitro-*

1,3-dinitroanilinobenzene is formed by heating 5-nitro-*m*-phenylenediamine with 2 mols. of picryl chloride and the calcd. amt. of NaOAc under a reflux condenser; it forms orange-red crystals, blackens at 240° , m. 260° (decompn.). *Nitrochrysoidine*, $\text{NPh} : \text{N}_2\text{C}_6\text{H}_4(\text{NH}_2)_2\text{NO}_2$, is obtained in the form of the HCl salt by gradual addition of PhNH_2 in dil. HCl to nitrophenylenediamine in 10% HCl and addition of KOAc soln. until the HCl reaction nearly disappears; it forms brown crystals with steely luster; the aq. soln. is orange and turns red on adding excess of HCl. *1-Nitro-3-amino-6-dimethylaminophenazine*, $\text{NMe}_2\text{C}_6\text{H}_3\text{N}_2\text{H}_3(\text{NH}_2)\text{NO}_2$, formed by heating for 3 hrs. in H_2O the cryst. product obtained by warming together for a short time $\text{ONC}_6\text{H}_4\text{NMe}_2$, HCl and nitro-*m*-phenylenediamine, forms reddish brown needles with varying amts. of water of crystn., gives red solns. in dil. and blue solns. in concd. acids. Anhydro compds. of varying compn. are obtained by condensation of nitro-*m*-phenylenediamine with aq. CH_3O . $4,2,6\text{-O}_2\text{N}(\text{H}_2\text{N})_2\text{C}_6\text{H}_3\text{OH}$ is obtained by passing H_2S into picric acid in hot dil. NH_4OH until no ppt. is given by addn. of dil. HCl to a small quantity of the filtered concd. soln.; the soln. is evapd. to small vol. with dil. HCl, H_2SO_4 (1 : 1) is added to the filtered soln. and the pptd. sulfate is decompd. by NaOAc . $3,5\text{-(H}_2\text{N)}_2\text{-C}_6\text{H}_3\text{CO}_2\text{H}$ is formed by reduction of the di- NO_2 acid in H_2O . The latter, by complete reduction in H_2O , gives *m*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$, and by careful partial reduction, $2,4\text{-O}_2\text{N}(\text{H}_2\text{N})\text{-C}_6\text{H}_3\text{CO}_2\text{H}$. *4-Dimethylaminobenzenesazo-2-nitrobenzoic acid*, formed by diazotization of nitroaminobenzoic acid and heating with alc. PhNMe_2 , crysts. in scarlet-red scales tinged with violet, m. 216° (decompn.), sol. in dil. acids and alkalis; the compd. is a NO_2 deriv. of methyl red, and is not less sensitive as an indicator. J. C. S.

Catalytic preparation of aniline. II. O. W. BROWN AND C. O. HENKE. *J. Phys. Chem.* 26, 272-87 (1922); cf. *C. A.* 16, 1403.—A further study of the catalyzers active in the reduction of PhNO_2 . Co was found to be more active than Ni at a lower temp. Fe carries the reduction too far. Ag is better than Cu because it can be used at a much higher rate of flow of the PhNO_2 . Sb, Mn, Cr. the lower oxides of Mo, V, U, W and Ce act as catalysts in this reduction. Alumina possesses a little activity, probably of a dehydration nature. Te, CaO, BaO and Si were without action. In the case of Fe and Sb part of the action was due to oxidation of the element. T. E. DUNLAP

Complex tautomerism. H. LEY AND R. GRAU. *Z. physik. Chem.* 100, 271-5 (1922).—When a NO_2 deriv., $\text{HR}(\text{NO}_2)_x$, of a hydrocarbon unites with an aromatic amine, $\text{R}'\text{NA}_1$, and there enters into the mol. of the NO_2 compd. a salt-forming group whose H may ionize, the formation of 2 compds. is possible: (1) $(\text{NO}_2)_x\text{RX}[\text{H} \dots \text{NR}'\text{A}_1]$,

(2) $\text{HX}(\text{NO}_2)_2 \dots \text{R}^+\text{NA}_2$. The 3,5-dinitrobenzoate of PhNEt_3 can exist in either of these forms. The solid salt which exists as bright yellow crystals dissolves in H_2O to form a colorless soln. In this solvent the compd. exists in the NH_4 salt form and has the characteristic properties of salts, such as cond., etc. It dissolves in indifferent solvents, such as MeOH , EtOH , AmOH , Et_2O and CHCl_3 , giving yellow to yellow-red solns. In these solvents the compd. exists in form (2). The formation of the colored complex form from the salt takes place when the solid salt is melted under H_2O . The compd. $\text{C}_6\text{H}_3(\text{NO}_2)_2\text{CO}_2\text{H} \cdot \text{PhNEt}_3$ m. 93° . When heated under H_2O it m. 70° to red-brown drops which, on cooling, solidify to the colorless NH_4 salt, m. 93° .

H. JERMAIN CREIGHTON

The blue oxidation product of diphenylamine. F. KEHRMANN AND G. ROY. *Ber.* 55B, 156-8(1922); cf. *C. A.* 16, 901.—The present paper is a report of some further expts. showing that acid oxidation of Ph_2NH gives the intensely violet-blue imonium salt of *N, N'*-diphenylbenzidine (A). Ph_2NH (0.2 g.) in 19 g. cold concd. H_2SO_4 cautiously dild. with 10 g. H_2O , slowly treated with 0.1 g. KNO_3 and, when the intensity of the resulting blue color no longer increases, poured into 200 cc. cold H_2O gives a clear blue soln., which is decolorized by a little Zn dust, with deposition of green flocks of the quinhydrone salt of A; this on heating in AcOH with Zn dust and a drop of HCl , pptg. with H_2O and extg. with C_6H_6 yields 0.12 g. A, light gray leaflets, m. $234-5^\circ$. Similarly, 0.08 g. A is obtained from 0.2 g. Ph_2NH in 30 g. concd. H_2SO_4 and 7 g. H_2O with 0.2 g. KNO_3 , and 0.31 g. A from 0.5 g. Ph_2NH in 40 g. H_2SO_4 and 10 g. H_2O with MnO_2 . The reason that the blue H_2SO_4 solns. oxidized with KNO_3 so frequently are almost completely decolorized, with sepn. of a green to brown ppt., when dild. with ice H_2O is that the HNO_2 formed by reduction of the HNO_3 and held in the concd. H_2SO_4 as nitrosyl sulfate is liberated on diln. with the H_2O and exerts partly a reducing and partly a nitrosating action on the blue imonium salt of A, as shown by the fact that 0.1 g. A in 80% H_2SO_4 oxidized to a violet color with MnO_2 undergoes no change when treated with 0.2 g. NaNO_2 but if ice is now cautiously added, evolution of NO begins when the H_2SO_4 has been dild. to about 40%, with deposition of green flocks quickly becoming brown, and the blue soln. becomes colorless. The flocks dissolve for the most part in C_6H_6 , which on evapn. deposits orange crystals of nitrosated A. C. A. R.

The synthesis of aromatic ketones by the use of mixed zinc organic compounds. F. MAUTHNER. *J. prakt. Chem.* 103, 391-6(1922); cf. *C. A.* 5, 3229.—The ketones necessary for the synthesis of compds. derived from plants are often difficult to prep.; the reaction between aromatic acid chlorides and mixed Zn org. compds. has been studied. The yields in this method depend upon the reactivity of the acid chloride used. The Zn-Cu couple used in the expts. was prepd by the method of Gladstone and Tribe (cf. *J. Chem. Soc.* 45, 154(1884)), washed with EtOH and dried in an electrically heated combustion tube in an atm. of H at $50-60^\circ$ for 2 hrs. 24 g. Mef , 20 g. Zn-Cu, 8 g. AcOEt , 16 g. PhMe and a crystal of I_2 are heated on a water bath 1 hr. under a reflux with a CaCl_2 tube to protect the contents from H_2O and then heated 0.5 hr. at 110° ; the mixt. is cooled, decanted into a dry flask, the remaining Zn washed several times with PhMe and the washings are added to the decanted liquid. The soln. of the Zn org. compds. is cooled with ice and a PhMe soln. of the acid chloride is added slowly with shaking; after 0.5 hr. at room temp. it is poured into H_2O , made acid with dil. H_2SO_4 , extd. with Et_2O , the latter washed with K_2CO_3 contg. a small amt. of $\text{Na}_2\text{S}_2\text{O}_4$, then successively with dil. NH_4OH and H_2SO_4 , dried over Na_2SO_4 and distd. The following compds. were prepd.: *ethyl o-tolyl ketone*, h. $219-20^\circ$, 47.8% yield; *m-acetotoluene*, h. 220° , 43% yield; *ethyl p-tolyl ketone*, h. $238-9^\circ$; *2-methoxy-3-methylphenyl ethyl ketone*, b_D^{25} 122° ; *2-methoxy-4-methylphenyl ethyl ketone*, b_D^{25} 147° ; *2-methoxy-5-methylphenyl ethyl ketone*, b_D^{25} $142-3^\circ$; *p-acetylanisole* (cf. *Ber.* 23, 1201(1890)); *3,5-dimethoxyphenyl*

ethyl ketone, b_{11} , 168–70°. 3,5-Dimethoxypropylbenzene was prepd. by reduction of the corresponding ketone with Zn and HCl (cf. C. A. 2, 3077), b_{11} , 126–7°. This investigation is being contd. N. A. LANGE

Action of mercuric acetate on the aminoazo compounds. I. VECCHIOTTI. *Gazz. chim. ital.* 52, I, 137–9(1922).—Martinotti recently introduced diaminoazobenzene hydrochloride (A) (chrysoidine) into therapy because of its cicatrizing action. It seemed of interest to prep. the Hg compd. and see if it retained the cicatrizing effect and had also the sp. action of Hg. The diazotization of the Hg aniline and copulation of the diazo compds. obtained with amines and phenols gives derivs. of known constitution but the method failed in this case. The aminoazo compds. were, however, mercurized and the 1st results are given here. 3.20 g. $\text{Hg}(\text{OAc})_2$ in 20 cc. H_2O and 20 cc. EtOH (made clear with a drop of AcOH) were treated with 1.97 g. aminoazobenzene in 80 cc. EtOH. After 2 days a compd. $\text{C}_{12}\text{H}_{11}\text{N}_3\text{HgOAc}$, m. 174°, seps. as an orange powder. 64 g. $\text{Hg}(\text{OAc})_2$ in 250 cc. H_2O + 250 cc. EtOH as above treated as before with 43 g. A in 1500 cc. EtOH gave after 2 days an abundant blood-red ppt. The ppt. was removed and washed abundantly with EtOH. The ppt. was extd. under a condenser with 1500 cc. EtOH, several times. From the EtOH soln. a compd. $\text{C}_{12}\text{H}_{10}\text{N}_4(\text{HgOAc})_2$ sepd. as red-violet scales, m. 186°. On addition of H_2O to the EtOH filtrate a compd., $\text{C}_{12}\text{H}_{11}\text{N}_4\text{HgOAc}$, sepd. as an orange-yellow powder, m. 165°. The EtOH-insol. residue extd. with glacial AcOH and treated with NH_4OH gave after several days a compd. $(\text{C}_{12}\text{H}_{11}\text{N}_4)_2\text{Hg}$, dark red needles, m. 110°. E. J. WITZEMANN

Preparation of *p*-nitrophenylhydrazine and other aromatic hydrazines. Wm. DAVIES. *J. Chem. Soc.* 121, 715–21(1922).— $\text{p-O}_2\text{NC}_6\text{H}_4\text{NHNH}_2$ may be prepd. by adding the $\text{O}_2\text{NC}_6\text{H}_4\text{N}_2\text{Cl}$ from 10 g. $\text{O}_2\text{NC}_6\text{H}_4\text{NH}_2$ and 21 cc. concd. HCl to 41 g. Na_2SO_3 in 100 cc. H_2O containing 4 g. NaOH, the addition requiring 5 min. After 5 min. the soln. is acidified with 70 cc. concd. HCl, heated at 55° for 3 min. and on the following day the crystals are heated with 20 cc. concd. HCl for 7 min. The yield is 7–8 g. The reaction apparently proceeds with the formation of a disulfonate, which is hydrolyzed by the HCl to the monosulfonate, minute yellow-lemon needles, decomp. 107°. Better results are obtained by using 40 cc. $(\text{NH}_4)_2\text{SO}_3$ soln. containing 8 cc. concd. NH_4OH , with sufficient cooling. Ammonium *p*-nitrophenylhydrazinedisulfonate seps. in minute yellow needles, decomp. 105–9°. Its soly. at 12° is about 4.5. On heating this ppt. with concd. HCl for 7 min. at 70–80°, the HCl salt of the base is formed, from which 9 g. of base may be obtained. Ammonium *m*-nitro-*p*-tolylhydrazinesulfonate crysts. from H_2O in deep yellow needles, which instantly become pink on addition of NaOH and then rapidly colorless. When acidified, 1-hydroxy- δ -methyl-1,2,3-benzotriazole ppts. (*Ann.* 311, 340). C. J. WREST

The basic properties of hydrazones. II. R. CIUSA AND L. VECCHIOTTI. *Gazz. chim. ital.* 52, I, 128–34(1922).—In a previous paper (C. A. 16, 556) the halochromism of hydrazones and their capacity to give colored compds. with quinones was demonstrated. According to Pfeiffer's views (C. A. 11, 1410) on the constitution of quinoxalones, of addition products and of halochromic compds. the hydrazone compds. in question have the following formulas: $(\text{PhCH}:\text{NNHPh})\cdots\cdots\text{HCl}$; $(\text{PhCH}:\text{NNHPh})\cdots\cdots\text{O}:\text{C}_6\text{H}_4:\text{O}$; $(\text{PhCH}:\text{NNHPh})\cdots\cdots 2(\text{NO}_2)_2\text{C}_6\text{H}_2\text{Cl}$. The latter is represented thus: $\text{ClC}_6\text{H}_3(\text{NO}_2)_2\cdots\cdots\text{PhCH}:\text{N}:\text{NHPH}\cdots\cdots(\text{NO}_2)_2\text{C}_6\text{H}_2\text{Cl}$ and if one Cl is replaced by OH it can theoretically give 2 isomers. C. and V. obtained addition compds. with 2 different NO_2 compds. and hydrazones which were previously unknown. They obtained $\text{PhCH}:\text{NNHPh}.\text{C}_6\text{H}_2(\text{NO}_2)_2.\text{C}_6\text{H}_2(\text{NO}_2)_2\text{OH}$ (A), m. 94–5°, and $\text{PhCH}:\text{NNHPh}.\text{C}_6\text{H}_2(\text{NO}_2)_2.\text{ClC}_6\text{H}_3(\text{NO}_2)_2\text{Me}$ (B), m. 82°, but could obtain no decisive results concerning isomers. By adding the NO_2 compds. in the opposite order in the prepn. of A a slight difference in color and in decompn. on diln. was observed; both m. 90° and after recrystn. at 95°.

Even such evidence was lacking with B. In order to observe the influence of the substitution of Me in the methinic H of benzalhydrazone on the coloration of the balochromic hydrochloride $\text{PbCH} : \text{NNHMePh}$ (C) in Et_2O was treated with dry HCl. Under the same conditions $\text{PhCH} : \text{NNHPh}$ gives an orange-red hydrochloride. C, however, gives a compd. $\text{C}_{14}\text{H}_{10}\text{N}_4$ (D), m. 155° (instead of 104°), which is a dimer of C less 2 H atoms. D on hydrolysis gives BzH and $\text{C}_{14}\text{H}_{10}\text{N}_4$, which was isolated as a chloroplatinate. The constitution of D was not detd. but it is thought that C first undergoes a semidine transformation and that 2 mols. of this deriv. of MePhNH ($p\text{-PbCH} : \text{N} : \text{C}_6\text{H}_4\text{NHMe}$) condense with oxidation to give D. Anisic aldehyde methylphenylhydrazone, $\text{C}_{14}\text{H}_{14}\text{ON}_2$, under the same conditions adds an atom of O, giving $\text{C}_{14}\text{H}_{14}\text{O}_2\text{N}_2$, m. 233° . In studying the behavior of the bond N-N in hydrazones in comparison with that of tri- and tetra substituted hydrazine, C. and V. prepd. *benzophenone diphenylhydrazone*, $\text{Ph}_2\text{C} : \text{NNPh}_2$, yellow needles, m. 145° , which is quite similar structurally to $(\text{NPh})_2$.

E. J. WITZERMANN

Introduction of the chloroethyl group into phenols, alcohols, and amino compounds. G. R. CLEMO AND W. H. PERKIN, JR. *J. Chem. Soc.* 121, 642-9 (1922).— β -Chloroethyl *toluene-p-sulfonate* (A), b_{17} 210° , is formed by boiling $\text{MeC}_6\text{H}_4\text{SO}_3\text{Cl}$ with $\text{HOCH}_2\text{CH}_2\text{Cl}$ under a reflux for 3 hrs. It is rather less viscous than $\text{C}_6\text{H}_5(\text{OH})$, and is almost insol. in H_2O . With PbOH it readily yields 80% $\text{PhOCH}_2\text{CH}_2\text{Cl}$. *o-Tolyl β -chloroethyl ether*, b_{17} $227-9^\circ$. *p-Nitro-o-tolyl β -chloroethyl ether*, pale yellow prisms, m. 66° . When the NO_2 group is *o*- or *p*- to the HO group, alkylation does not take place. β -Phenoxyethylamine, from PhNH_2 and $\text{PhOCH}_2\text{CH}_2\text{Cl}$ (B), plates, m. $49-50^\circ$. *p-Nitroso- β -phenoxydiethylamine*, brilliant green prisms, m. 94° . *o-Acetylaminophenyl β -chloroethyl ether*, from *o*-AcNH $\text{C}_6\text{H}_4\text{OH}$ and A, prisms, m. $97-8^\circ$. The *p*-derivative also forms prisms, m. $126-7^\circ$. $\beta\text{-C}_{10}\text{H}_7\text{OH}$ gives β -naphthyl β -chloroethyl ether (C), plates, m. 83° . The α -naphthyl derivative b_{14} 202° and m. 28° . C, heated with concd. aq. NH_4OH at 140° , gave, among other products, β, β' -di-2-naphthoxydiethylamine, $(\text{C}_{10}\text{H}_7\text{OC}_2\text{H}_5)_2\text{NH}$, prisms, m. $103-4^\circ$. With Me_2NH , β -naphthyl β -dimethylaminoethyl ether was isolated, b_{17} 200° , m. $16-17^\circ$, analyzed as the hydrochloride, m. 185° . This has local anesthetic action. 1-Nitro- β -naphthyl β -chloroethyl ether, by nitrating C in glacial AcOH and HNO_3 , pale yellow prisms, m. 120° ; reduced with SnCl_2 and HCl , the 1-amino derivative results, leaflets, m. 85° ; heated with K_2CO_3 and a trace of Cu powder in AmOH , this yields α, β -naphthodihydroisoxazine, $\text{C}_{10}\text{H}_7\text{NH.CH}_2\text{CH}_2\text{O}$, cubes, m. $44-5^\circ$. PhNH_2 reacts

readily with A but the initial product of the reaction has not been isolated, because it undergoes condensation with itself, and other substances, so that the substances actually isolated were $\text{C}_6\text{H}_4(\text{NHPh})_2$ and $\text{PhN}(\text{C}_6\text{H}_4\text{CH}_2)_2\text{NPh}$. Di[*toluene-p-sulfo*]-diphenylethylenediamine was obtained by the further action of A upon the oily basic part of the reaction product, plates, m. 223° . PhNHMe and A give chiefly $\text{PhNMeCH}_2\text{CH}_2\text{NMePh}$, but some β -chloroethylmethylamine was isolated b_{10} 124° , which, with $\beta\text{-C}_{10}\text{H}_7\text{OH}$, gives β -naphthoxyethylmethylamine, plates, m. $73-5^\circ$. Benzyl chloroethyl ether, oil, b_{18} $95-110^\circ$, with pronounced odor of oranges. This reacts with Et_3NH to form β -benzoxylethylamine, b_{17} 145° , which forms an ethinide, plates, m. 105° .

C. J. WEST

Benzenedisulfonic acid from benzenemonosulfonic acid. C. E. SENSEMANN. *J. Ind. Eng. Chem.* 13, 1124-6 (1921).—Mixts. of PbSO_4H and 95 and 98% H_2SO_4 in from 50 to 700% excess were heated from 1 to 10 hrs. in an enameled kettle at 220° , 250° and 280° . In some expts. Na_2CO_3 and V_2O_5 were used as catalysts. The largest yields of the di- SO_3H acid were obtained at 220° and 250° and 95% H_2SO_4 in 300% or less excess. When no catalysts were used the yields were 87 to 89% after 9 or 10 hrs. heating. With Na_2CO_3 as the catalyst the yield at the end of the first hr. was 91.9%, but it did

not increase on continued heating. The yield was slightly increased when V_2O_5 was used as the catalyst, but no particular advantage was gained when mixts. of Na_2CO_3 and V_2O_5 were used.

G. W. STRATTON

Dehydrothiitoluidine. Its isomers, homologs, analogs and derivatives. MARTIN MEYER. *Diss. Columbia Univ.* 1921, 47 pp.—The prepn. of *oxalaminothiophenol* by fusion of $PhNHAc$ and S (cf. Hofmann, *Ber.* 13, 1223(1880); Lauth, *Bull. soc. chim.* 15, 82(1896)) gave yields less than 5% of the $PhNHAc$ used. *2-p-[Tolyl]benzothiazole* (cf. H. *Ber.* 12, 2359(1879); Gatterman, *Ber.* 22, 422, 1063(1889)) prepd. by fusion of *p-MeC₆H₄NHAc* and S gave yields less than 1%; a modification using $C_{10}H_8$ as solvent and heating 2 hrs. at 160–200° did not give better results. $PhNHCSC_6H_5Me$ (A) was prepd. in 80% yield by stirring a mixt. of 15 g. $PhNCS$, 30 g. $PhMe$ and 30 g. $AlCl_3$ for 2 hrs. on a water bath and allowing to stand overnight; ice was added, the $PhMe$ and $PhNCS$ removed with steam, the residue on cooling deposited crystals which were purified by extrn. with 10% KOH from which it was pptd. by 20% H_2SO_4 . *p-Tolylbenzothiazole* (B) was prepd. in 60–75% yield by adding a 20% soln. of $K_4Fe(CN)_6$ to A in NaOH; after 24 hrs. the ppt. was extd. with concd. HCl and then pptd. with H_2O ; crystals from EtOH, m. 85°. Thiocarbanilide under the same conditions gave a low yield of a compd., m. 144.5°, which is probably *2-phenylaminobenzothiazole* (C); a larger amt. of an unknown compd. was formed, yellow needles from EtOH, m. 237.5°. C was also prepd. with good yields by hydrolysis of the di-Br addition product of thiocarbanilide with Na_2CO_3 (cf. Hegershoff, *Ber.* 36, 3127(1903)); crystals from EtOH, m. 161°. *Tri-[2-anilino-benzothiazolyl]-carbinol* (D) was prepd. by heating 20 g. B and 10 g. $H_2C_2O_4$ to 170° for 15–20 min., adding 10 g. $H_2C_2O_4$ and heating to 190° for 2 hrs.; the fusion is extd. with hot H_2O , the residue dissolved in EtOH, HCl is added and evapd. to a paste, boiled with EtOH and NaOH, cooled, filtered, the filtrate neutralized with HCl, filtered, 2 vols. H_2O are added to the filtrate and allowed to stand 1 hr.; the ppt. is a mixt. of the *leuco-* and *color-bases* which on oxidation with PbO_2 give D; an attempt was made to sulfonate C with 15% fuming H_2SO_4 . D with $HNO_3-H_2SO_4$ (1 : 1) at the temp. of the steam bath after 1 hr. gave a quant. yield of *nitrotolylbenzothiazole*, crystals from $PhMe$, m. 219.5°; when reduced with Zn or Sn and HCl the *amino derivative* (E) is obtained, brown crystals from $PhMe$, m. 229°; E was diazotized and coupled with a no. of amines and phenols, yielding azo dyes, which are recorded with their colors and dyeing properties. The yield of *p-[2-benzothiazole] benzoic acid* prepd. by oxidation was very low. An unknown S compd. was obtained on fusion of *p-O₂NC₆H₄Me* and S which sublimes about 230°. All known methods for the prepn. of *dehydrothiitoluidine* (F) were tried but the yields of pure compd. were low in all cases. A modified form of the usual vacuum distn. app. adapted to the distn. of F is described with drawings. F is best prepd. by heating 110 g. *p-MeC₆H₄NH₂* and 60 g. S at 220° for 4–6 hrs.; after distn. *in vacuo* it is recrystd. from EtOH; yellow needles, m. 194.8°. *Benzaldehydrothiitoluidine* from BzH and F, forms yellow plates from EtOH, m. 193°. F does not condense with BzH and pyruvic acid to form a methylbenzothiazolylatophan. *6-[6-Methylbenzothiazolyl]quinoline* prepd. by condensation of F with $C_6H_4(OH)_2$, H_2SO_4 and H_3AsO_4 (cf. Kneuppel, *Ber.* 29, 709(1896)) forms brown crystals from EtOH, m. 147°. The thiazole structure is probably not a chromophore but seems to play an important part in modifying the colors obtained; it is not an odorophore; the com. methods by which F is being prepd. do not give yields greater than 35% and some of this is lost in further purification. Also in *Chem. News* 124, 319–23(1922).

N. A. LANGE

Condensation between carbonyl compounds and resorcinol or phloroglucinol. ASTRID CLEVE VON EULER. *Arkiv. Kemi Mineral Geol.* 3, No. 3, 40 pp.(1922).—A very comprehensive review.

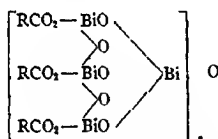
C. E. CARLSON

Optical activation by catalysis of phenylmethylcarbinol. HENRI WUYTS. *Bull.*

soc. chim. Belg. 30, 30-41 (1921).—PhMeCHOH was subjected to catalytic dehydration by the action of 1% or more of camphorsulfonic acid at 100-8°. The predominating reaction under these conditions was the formation of the ether oxide, b_{17} 156.5° d₄¹⁸ 1.0058, and water, but styrene also was formed, which, however, being the most volatile substance present, could be for the most part distd. off during the operation by the employment of a suitable vacuum. At the end of the heating the active camphorsulfonic acid was eliminated as a residue by adding the requisite quantity of benzidine and removing the unchanged carbinol and the ether oxide by distn. in a high vacuum. It was found that this distillate exhibited optical activity, but the result of successive operations on the same material showed that this activation tended towards a limit of the order of $\alpha = 2.86^\circ$. By fractional distn. of a prepn. which had only been exposed for a short period to the action of the catalyst, the unchanged carbinol and its ether oxide were isolated. Both were *l*-rotatory, $\alpha_D -0.19^\circ$ and -1.11° , resp., and there is accordingly a change of sign of rotatory power in passing from carbinol to oxide.

J. C. S.

Hydrolytic cleavage of phenolcarboxylic acids from their bismuth salts. A. PERLING. *Ber. pharm. Ges.* 31, 433-8 (1921).—Both the neutral and basic salts of benzoic, salicylic, protocatechuic, gallic and cinnamic acids were examd. under varying conditions of time and temp., with the result that the quantities of Bi₂O₃ remaining in combination with the acid radicals after the hydrolytic treatment were approx. equal for each pair of salts. These values, furthermore, proved to be nearly identical with those calcd. for Bi₂O₃, with the assumption that the Godfrin (cf. C. A. 5, 2300) formulation for such salts is true:



from which it is probable that the hydrolytic cleavage never progresses beyond a certain point, the same for both neutral and basic pairs. W. O. E.

The replacement of halogen in 1-chloro-2-nitro-4-cyanobenzene and in 1-bromo-2-nitro-4-cyanobenzene. II. TH. J. F. MATTAAR. *Rec. trav. chim.* 41, 103-11 (1922).—In the previous paper (C. A. 16, 1224) M. showed that the halogen atom in 4,3-Cl(NO₂)-C₆H₃CN (A) and 4,3-Br(NO₂)-C₆H₃CN (B) is easily substituted by other groups as in 2,4-(NO₂)₂C₆H₃Cl (C) and 2,4-(NO₂)₂C₆H₃Br (D), and M. has now detd. the velocity of substitution with NaOMe, NaOEt and PhONa in MeOH and EtOH, resp., for these 4 compds. The method of Lulofs (*Rec. trav. chim.* 20, 292 (1901)) was used: A known amt. of the compd. in a 250-cc. graduated flask was dissolved in 150 cc. 99.8% EtOH, the calcd. amt. of NaOEt added, the vol. made up to the mark, and 25 cc. of the mixt. placed in each of 6 flasks (80 cc.) in a thermostat at 25°. After 10 mins. the 1st flask was removed and the contents poured into 125 cc. CO₂-free H₂O. The alkali present was detd. by adding a known excess of 0.1 N HCl and titrating back with 0.1 N NaOH, using phenolphthalein. In the MeONa expts. 99.8% MeOH was used. The results given in 8 tables may be summarized thus: the velocity consts. at 25° for NaOMe in MeOH and NaOEt in EtOH with C were 1.506 and 2.98, with A 0.0140 and 0.0424, with D 1.117 and 2.46, and with B 0.0102 and 0.0309, resp. The results show that the substitution of a NO₂ group in 4 with a CN group in C and D diminishes the activity of the halogen atom. In A and B the Cl atom is more easily replaced than the Br atom, which is also true in C and D (Lulofs; *l. c.*). The reaction with NaOEt is faster than

with NaOMe. With NaOPh at 25° in MeOH and EtOH C gave 0.429 and 0.900 and A, 0.0137 and 0.0297, resp., as the velocity consts. at 25°. In this case the reaction is about twice as fast in EtOH as in MeOH, which conforms with the results of Conrad, Hecht, Brückner (*Z. physik. Chem.* 3, 450(1889); 4, 273(1889); 5, 289(1890)) on the action of alkyl halides with Na alcohols.

E. J. WITZEMANN,

Constitution of catechin. IV. MAXIMILIAN NIERENSTEIN. *J. Chem. Soc.* 121, 604-13(1922); cf. *C. A.* 15, 1502.—3-Bromo-2-hydroxy-4,6,3',4'-tetramethoxy-3-phenylchroman, obtained by the action of Br on acacatechin tetra-Me ether (A) in Ac₂O, forms needles, m. 191-2°. The Br is replaced by boiling with abs. MeOH, forming 2-hydroxy-3,4,6,3',4'-pentamethoxy-3-phenylchroman (B), prismatic needles, m. 163-4°; acetate, needles, m. 147-8°. With abs. EtOH, the corresponding 3-ethoxy derivative is formed, small needles, m. 168°. The oxidation of B with KMnO₄ gives the same products as obtained from A, veratric acid and C₆H₅(OMe)₂OH. Both the Br and HO derivs. are readily reduced by Zn-KOH in EtOH to A. The action of SOCl₂ upon A in dry C₆H₆ gives the 2-chloro derivative (C), small cubes from C₆H₆-ligroin, m. 116°. The Cl in C may be removed by transforming C into the Grignard reagent (use of activated Mg) and decomp. with ice and HCl, forming 4,6,3',4'-tetramethoxy-3-phenylchroman (D), small cubes, m. 94°, in 67 % yield, while reduction by Zelinsky's method gave only 15 %, the main product being a polymerized D, needles, m. 218°, also formed in small amts. from the Grignard reagent. 3-Bromo derivative, by the action of Br on D in AcOH, small needles, m. 147-9°, which is reduced by Zn-KOH to D. With MeOH, 3,4,6,3',4'-pentamethoxy-3-phenylchroman (E), star-shaped needles, m. 127°, is formed. B and SOCl₂ in dry C₆H₆ give 2-chloro-3,4,6,3',4'-pentamethoxy-3-phenylchroman, long, pointed needles, m. 97°, readily reduced by Mg to E. The results of Freudenberg (*C. A.* 15, 3471) as to the identity of "Kostanecki's methylated reduction product" and 3,4,2',4',6'-pentamethoxy- α,γ -diphenylpropane are questioned, the present results showing that it is identical with the α,α -deriv.

C. J. WYSE

Molecular coefficients of refraction. K. v. AUWERS and H. KOLLIGS. *Ber.* 55B, 21-45(1922); cf. Eisenlohr, *C. A.* 15, 2079.—The multitude of data collected by E. make it plain that the mol. coeff. of refraction is unusually sensitive to changes in structure, but it is more difficult to judge of the correctness of these data and therefore to what degree they can be practically applied. Every discoverer of a new generalization is quite justified in provisionally leaving aside detns. which do not fit the rules if such detns. are isolated exceptions and the rules are otherwise well established, as there is a possibility that such detns. were inexact or made on impure materials. But to reject the concordant detns. of various workers, without making any attempt to verify or disprove them experimentally, simply because they do not fit in with the new rules, is quite another matter, and of this E. has been guilty. Thus, of the data in the literature on the 11 alcs. and 10 ketones of the cyclohexane series which he cites to show that the *E*-value of the alc. or ketone minus 0.35 equals, within the exptl. error, the *E*-value of the hydrocarbon, he believes that those for 2 of the alcs. and 3 of the ketones are wrong and calcs. for them their "true values" from his rules; these calcd. values for n_D^{20} for *p*-methylcyclohexanol (A) and *p*-methylcyclohexanone (B) are 1.4528 and 1.4391, while the values found by 4 investigators on 3 different preps. of A, one of which, at least, had been purified with the greatest care, range from 1.4571 to 1.4596. The only conceivable impurities which could cause such a difference are cyclohexanol and *o*-methylcyclohexanol, but there would have to be about 40% of the former and 50% of the latter. Nor can stereoisomerism be responsible for the difference, for in such simple compds. the differences in the consts. of the stereoisomers are very slight; new detns. on Skita preps. gave 1.4588 for the *cis*- and 1.4592 for the *trans*-form of A. Again, a sample of A whose purity had been proved by the m. p. (123.5-4.5°) of its phenylurethan showed

n_D^{20} 1.4581, and a prepn. freed from any trace of admixed ketone by treatment with Na and boiling alc. showed 1.4579. Similarly, B prepd. from a semicarbazone of const. m. p. gave n_D^{20} 1.44504. Again, in reducing the values of n_D of C_6H_6 and its homologs given in the literature to 20°, E. says: "For the aromatic hydrocarbons it will be well to use the factor $-dn/dt = 0.00065$ or 0.00060 which has been established for C_6H_6 ," instead of the value 0.00045 generally used, while as a matter of fact actual detns. for the interval about 5° to about 20° gave the following values ($\times 10^{-5}$) for the factor: C_6H_6 60–62, PhMe 56, PhEt 51, PhPr 46, iso-PrPh 48, *m*-xylene 47, *p*-xylene 47, *o*-MeC₆H₄Et 46, *m*-MeC₆H₄Et 45, *p*-MeC₆H₄Et 44, *o*-MeC₆H₄Pr 46, *m*-MeC₆H₄Pr 46, *p*-MeC₆H₄Pr 44, *p*-MeC₆H₄CHMe₂ 44, *p*-C₆H₄Et₂ 45, pseudocumene 44, mesitylene 46, prehnitole 43, ethylmesitylene 45. E. having expressed the opinion that v. A.'s *m*- and *p*-EtC₆H₄Me, *m*- and *p*-PrC₆H₄Me and *p*-C₆H₄Et₂ (all obtained from the ketones with amalgamated Zn and HCl) were impure, these compds. were again treated with amalgamated Zn and HCl, other samples were prepd. afresh, still others were distd. as many as 6 times over Na; some of the necessary ketones were prepd. by both the Friedel-Crafts method and by the following series of reactions: $MeC_6H_4CH_2Br \rightarrow MeC_6H_4CH(OH)Me \rightarrow MeC_6H_4COMe$. In every case the consts. of the resulting hydrocarbons were found to agree with the earlier detns. The hydrocarbons were also prepd. by replacing the HO group in the carbinols $MeC_6H_4CH(OH)R$ and reducing the resulting bromides, whose purity was controlled by analyses, with Na and moist Et₂O. The yields of const. boiling products varied, as the simultaneous formation of $(PhCH_2)_2$ derivs. could not be completely prevented, and n was in general somewhat lower than that of the products prepd. from the ketones. Finally, the hydrocarbons were prepd. by the Fittig method; n for these preps. was in all cases smaller (on an av., 0.002–0.003). Cymene obtained from camphor has a lower n than that prepd. from pure *p*-cymenesulfonic acid. Which of these preps. were the purer cannot at present be detd. From the chem. standpoint, it would seem that the Clemmensen method gives the purer products, as they are formed smoothly and in good yields and can easily be obtained with const. h. p., while those made by the Fittig method require repeated fractionation. On the other hand, n of the latter preps. fits in better with E.'s rules except in the case of cymene. Analytically, no difference could be detected in the various preps. A table of all the values in the literature for n_D^{20} , n_D^{20} , $M \times n_D^{20}$ (found and calcd.) and E for 24 C_6H_6 homologs is given. In calcg. $M \times n_D^{20}$, the value for C_6H_6 is taken as 117.22 and hence the equiv. for the ring with its 3 double bonds as ~ 21.10 . A critical consideration of the data leads v. A. and K. to the conclusion that while E. has undoubtedly rendered science a service and it is to be hoped that after a large no. of still varying and uncertain relationships have been cleared up the new method may be developed into a trustworthy instrument for exact investigation, nevertheless the mol. coeff. of refraction, from its very nature, cannot take the place of spectrochem. consts., especially sp. exaltations, but can only serve to supplement them. Whenever it is desired to det. whether a compd. belongs to a certain group of substances or to establish the general character of a group of substances, recourse must be had to the sp. exaltations, as they are but little affected by homology and position isomerism, but when it is desired to clear up structural questions of the above nature within a given group of substances the applicability of E.'s method begins to come into play. Some data are given on the hydrocarbons which have been prepd. anew; full details will be published in K.'s dissertation. The following new compds. are described: 1-Methyl-3-*i*'-bromoethylbenzene (11 g. from 15 g. *m*-MeC₆H₄CH(OH)Me heated 3 hrs. at 100° with 2 vols. HBr satd. at 0°), b_{11} 101°, gives in Et₂O with Na and H₂O *m*-MeC₆H₄Et and a compd., probably 2,3-di-*m*-tolylbutane, fine needles from MeOH, m. 97°, b. about 195°. 1-Methyl-4-*i*'-bromoethylbenzene, from *p*-MeC₆H₄CH(OH)Me and cold PBr₃, b_{11} 105–6°. 1-Methyl-3-*i*'-bromopropylbenzene, b_{11} 114°. *p*-Tolylethyl-

carbinol, from *p*-BrC₆H₄Me, Mg and EtCHO, *b*₁₂₋₃ 114°. 1-Methyl-4-1'-bromopropylbenzene, *b*₁₈ 108°. C. A. R.

Mechanism of catalytic hydrogenation. A. SKITA. *Ber.* 55B, 139-43(1922).—Willstätter and Waldschmidt-Leitz (*C. A.* 15, 2077) believe that a Pt superoxide or oxide is an intermediate product in catalytic hydrogenations, an assumption which S. has tested from 2 points of view. (1) S. has often found it preferable to use for the catalytic reduction of aliphatic and aromatic compds. colloidal solns. prepd. from salts of the Pt metals during the reaction rather than solns. prepd. beforehand. If W. and W.-L.'s views are correct, catalytic reduction would not take place under such conditions if O is excluded. Using compressed electrolytic H passed through alk. pyrogallol, then over a glowing Cu spiral and again through alk. pyrogallol, S. found that when 10 g. pulegone in 100 cc. alc. was treated with 100 cc. of boiled 1% gum arabic, the absorption vessel evacuated several times, then filled with H, a soln. of 0.3 g. PdCl₂ in 30 cc. boiled H₂O added, the app. again evacuated 3 times, filled with H under an excess pressure of 1 atm. and shaken, the calcd. amt. of H was absorbed in 30 min. and there was obtained 8 g. of menthone, *b.* 205-6°; when no particular precautions to exclude O were taken, there was no noticeable change in the velocity of absorption. Again, when 50 cc. of dialyzed colloidal Pt soln. (obtained by reduction of H₂PtCl₆ with N₂H₄ and soda) containing 0.25 g. Pt and 1.5 g. gum arabic in 80 cc. boiled H₂O was shaken 30 hrs. with H under 1 atm. excess pressure, then added to 10 g. *asym-p*-xylylidine, 17 cc. freshly distd. AcOH and 20 cc. concd. HCl (prepd. from HCl gas and boiled H₂O), shaken 3 hrs. with H, treated with H₂PtCl₆ (1 g. Pt) in 20 cc. boiled H₂O, and hydrogenated under 3 atm. excess pressure, 6 l. H (calcd. 5.6 l.) was absorbed in 3.5 hrs. and there was obtained 7.5 g. 1-amino-2,5-dimethylcyclohexanol, *b.* 146-7°; here again, there was no noticeable difference when no particular pains were taken to exclude O. Under the above conditions it cannot be assumed that a superoxide is formed, and the formation of Pt oxides or hydroxides could be explained only as due to a transformation of the Pt compds. in aq. solns. (2) If the Pt catalyzer were a superoxide it should liberate I from KI and hence catalytic hydrogenation should not occur in the presence of KI. Now, when 0.05 g. I in 30 cc. 96% alc. is shaken 2 hrs. with H with 100 cc. colloidal Pt soln. (0.1 g. Pt) prepd. as above, the starch-iodide and CS₂ reactions become negative, the AgNO₃ test positive, *i. e.*, the I is completely reduced to HI; when 25 cc. colloidal Pt soln. (0.125 g. Pt) is treated with 0.1 g. KI in 100 cc. H₂O, made faintly acid with AcOH and shaken with H, no I can be detected with starch-iodide or CS₂ but if to this soln. 5 g. PhOH is added and it is shaken with H under 3 atm. excess pressure at 40° the calcd. amt. of H is absorbed in 2 hrs. and cyclohexanol, *b.* 160°, is obtained. Again, 10 g. PhOH or 10 g. *asym-p*-xylenol with colloidal Pt soln. (0.4 g. Pt), 30 cc. AcOH, 10 cc. H₂PtCl₆ (0.3 g. Pt), 50 cc. of 10% gum arabic and 20 cc. concd. HCl absorb the calcd. amt. of H at room temp. in 40 min., yielding 7-8 g. cyclohexanol or 1-hydroxy-2,5-dimethylcyclohexane, *b.* 179°; addition of 0.1 g. NaCl in these last 2 cases produces no noticeable change; in the presence of 0.1 g. KI there is no absorption of H even after 10 hrs. at room temp. but at 50° absorption at once begins again although it is complete only after 6 hrs. in the case of the PhOH and after 8 hrs. in that of the xyleneol. C. A. R.

Stereoisomerism of the cyclic hydrocarbons. A. SKITA AND A. SCHNECK. *Ber.* 55B, 144-52(1922).—If v. Auwer's view (*C. A.* 14, 2160) that aromatic hydrocarbons by Sabatier's reduction method yield *trans*- and by the Pt method *cis*-compds. is correct the latter should afford a means of obtaining a whole series of the still unknown cyclic *cis*-hexamethylenes. The applicability of the Pt method to this problem has up to the present been limited by the fact that the H₂O which has to be added to the Pt colloid protected by gum arabic ppts. the aromatic hydrocarbons. S. and S. have

now successfully used for the purpose in question an AcOH-reversible Pt colloid (whose prepn. will be described shortly) in which the Pt is pptd. upon pure gelatin. Of the 3 xylenes (prepd. synthetically) 10 g. each in 80 cc. AcOH, was treated successively with 1.5 g. Pt (as H_2PtCl_4) in 10 cc. AcOH, 1.5 g. gelatin in 10 cc. AcOH, 15 cc. of the colloidal Pt soln. (0.25 g. Pt) and 5 cc. concd. HCl and hydrogenated at 80° under 3 atm. excess pressure; in 3-4 hrs. about 300 cc. more than the calcd. amt. of H was absorbed, yielding 8.5-9 g. hydrocarbon, which was shaken in ice with 10 g. fuming HNO_3 + 23 g. concd. H_2SO_4 until it no longer gave a yellow color either with this mixt. or with $C(NO_2)_4$. By distn. over Na and repeated fractional distn. *in vacuo* and under atm. pressure the products were sepd. into 2 portions of const. b. p., the higher boiling (*cis*-form) showing greater d. and n and smaller mol. refraction than the lower boiling (*trans*-form), whose consts. agree with those of v. A.'s products (obtained by the Sabatier method). Below are given, resp., the b. p., d_4^{20} , n_D^{20} , E_{20} and E for the six dimethylcyclohexanes: 1', 2', 126.5, 0.786, 1.43114, -0.004, -0.53; 1', 2', 124, 0.780, 1.43037, 0.20, -0.61; 1', 3', 121.5, 0.775, 1.42609, 0.12, -1.09; 1', 3', 119, 0.772, 1.42470, 0.16, -1.25; 1', 4', 121.5, 0.773, 1.42300, -0.003, -1.44; 1', 4', 119.5, 0.769, 1.42095, -0.023, -1.67. That these substances are pure is indicated by the fact that for the 3 pairs of isomers the ratio E *cis*-form: E *trans*-form is the same (0.87). An interesting relationship is the fact that the differences, E *cis*-form minus E *trans*-form, of the *o*-, *m*- and *p*-pairs are to each other as 1 : 2 : 3. Cymene (10 g.) at 75° gave 8 g. *cis*-*p*-menthane (*1'*-methyl-*4'*-isopropylcyclohexane), b. 168.5°, d_4^{20} 0.816, n_D^{20} 1.45149, E_{20} 0.08, E 1.34; the corresponding consts. of its *trans*-isomer are 161.0°, 0.792, 1.43931, 0.27, -0.24. Pseudocumene (15 g.) gives 13.9 g. of 1', 2', 4'-trimethylcyclohexane (A), b. 146°, identical with that obtained by catalytic reduction of pseudocumamol in acid soln. (C. A. 15, 852). While the 1', 2', 4'-trimethyl-4,5-cyclohexene (B) (obtained by dehydration with P_2O_5 of the *cis*-1-hydroxy-*cis*-2,4,5-trimethylcyclohexane formed by acid reduction of pseudocumamol) gives A on acid reduction, 5 g. in boiling alc. with 9.3 g. Na gives 3.2 g. of the 1', 2', 4'-isomer of A. Below are the b. p., d_4^{20} , n_D^{20} , E_{20} and E of the 3 known of the 4 possible 1,2,4-trimethylcyclohexanes: 1', 2', 4', 146, 0.790, 1.43314, -0.04, -0.77; 1', 2', 4', 142, 0.786, 1.43209, 0.06, -0.90; 1', 2', 4' (obtained by the Sabatier method), 140, 0.744, 1.42916, 0.21, -1.27. In the case of the last, it is not yet possible to det. whether it has the configuration 1', 2', 4' or 1', 2', 4'. The consts. of B, in the same order as above, are 147, 0.814, 1.44905, -0.15, -0.51, and those of the 1', 2', 4'-isomer (obtained by the Sabatier method) 145, 0.805, 1.44820, 0.16, -0.61. C, converted into the ketone and treated with $MeMgI$, gives the tertiary alcohol $C_{10}H_{18}O$, which with P_2O_5 cooled with ice yields 1', 2', 4, 5-tetramethylcyclohexene, b. 169°, d_4^{20} 0.828, n_D^{20} 1.46053, E_{20} 0.02, E 0.83; the corresponding values for the 1', 2', 4, 5-isomer obtained by the Sabatier method are 166°, 0.817, 1.45722, 0.24, 0.37.

C. A. R.

Catalytic preparation of the cyclohexanetriols. J. B. SENDERENS AND J. ABOULHIC. *Compt. rend.* 174, 616-8(1922); cf. C. A. 16, 1087.—The two 1,2,3-cyclohexanetriols (A) obtained by hydrogenation of pyrogallol in H_2O or EtOH at 140° and 40-50 kg./cm.² are sepd. by crystn. from EtOH. α -A is less sol., fine needles, m. 145°, b. 290°; α -A, rhombic plates, m. 95°, b. 225°. These give triacetates with AcOH. α - $C_6H_3(OAc)_3$, white needles, insol. in H_2O , m. 47°, b. 238°. α - $C_6H_3(OAc)_3$, colorless liquid, b. 238°. A gelatinous mixt. of isomeric 1,3,5-cyclohexanetriols (B) is obtained by hydrogenation of phloroglucinol in H_2O at 135-40° and 40 kg./cm.², b. 245-60°; EtOH soln. is unsatisfactory. B forms a triacetate with AcOH. The mixt. of isomeric 1,2,4-cyclohexanetriols obtained by hydrogenation of hydroxyhydroquinol in EtOH at 135-40° or H_2O at 100-10° and 50 kg./cm.² solidifies to a vitreous mass, b. 260-80°. T. E. D.

Some constituents of lignites. II. R. CRUA AND M. CROCE. *Gazz. chim. ital.* 52,

I, 125-8(1922).—The 10 natural org. substances and their m. ps. that have been isolated from lignite are listed. In the previous paper (C. A. 15, 2708) it was stated that bombicite (A) is a hydrocarbon, $C_{28}H_{34}$, m. 75° , that should be identical with the compd. (B) isolated from lignite from Terni. C. and C. have now obtained museum specimens of A and found them to be identical. Only enough branchite for m. p. detns. ($74-5^\circ$) was available but it is doubtless identical with A. Hartite extd. from lignite from Köflach does not lower the m. p. and gives the analytical data of A. Becchi gave $C_{28}H_{34}O$ for the formula and 71° as the m. p. of boffmannite but C. and C. found it to be identical with A after several recrystns. from EtOH. It is not possible to say whether A from all these various sources is derived from the same plant or not. $C_{28}H_{34}$ corresponds to the so-called hydrodicamphene obtained from pinene hydrochloride by Étard and Mecher. This compd. was prepd. but was found to be not identical with A. The question of the constitution of A is, therefore, as yet unsolved.

E. J. WITZEMANN

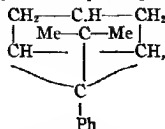
The fossil wax from Monte Falo. R. CIUSA AND R. VOIS. *Gazz. chim. ital.* 52, I, 135-6(1922).—In previous papers (cf. preceding abstr.) C. studied the hydrocarbons of lignite. The fossil wax from Monte Falo near Savigno was previously studied by Bombicci. It crystals in white, yellowish or gray scales, m. $47-9^\circ$, or $50-52^\circ$ after crystn. from EtOH. Heated with Na 24 hrs. at 100° it underwent no decompn., thus showing the absence of O and S. The wax was then fractionated *in vacuo* into 8 fractions: (1) b_{21} 247° , m. 47° ; (2) b_{23-29} $247-8^\circ$, m. 48° ; (3) b_{23-24} 250° , m. $49-50^\circ$; (4) b_{23-24} $250-70^\circ$, m. $49-50^\circ$; (5) b_{23} 280° , m. $55-6^\circ$; (6) b_{23-24} $280-95^\circ$, m. $54-5^\circ$; (7) b_{23-10} 292° , m. 56° ; (8) b_{23-8} $292-305^\circ$, m. $58-60^\circ$. Of these (1) was $C_{26}H_{42}$, m. $47-7.5^\circ$; (3) was $C_{26}H_{40}$, m. $50.7-51.3^\circ$; (5) was $C_{26}H_{38}$, m. $56-7^\circ$, according to the data of Kraft (Ber. 21, 2956) on fossil paraffin, and the analyses correspond to these formulas. This fossil is therefore paraffin and Bombicci's hypothesis that it is formed by the evapn. of petroleum is justified.

E. J. WITZEMANN

New halogen derivatives of camphor. II. α' -Bromocamphor. T. M. LOWRY, VICTOR STEELE AND HENRY BURGESS. *J. Chem. Soc.* 121, 633-41(1922); cf. C. A. 10, 175.— α' -Bromocamphor (A) has been prepd. from α -bromocamphor (B) by the addition 1st of alkali, in order to render the isomerism dynamic, and then of acid, in order to make it static; A was sepd. by fractional crystn. from MeOH or EtOH, m. 78° , $[\alpha]_{D_{25}} -40^\circ$ (10 % soln. in EtOH in a 4-dm. tube at 20°); it forms orthorhombic, holohedral needles, $a : b : c = 0.7389 : 1 : 0.4691$, B (010), $m(110)$, $c(101)$, d_1 1.484, refractive indices [detd. by total reflection from face (010)], α 1.5535, β 1.5787, γ 1.5912. On the addition of alkali both isomers pass to an equil. mixt. for which $[\alpha]_{D_{25}} = 149^\circ$. This corresponds to a mixt. containing 92 % of B. Quant. curves are given. The mean values of the consts. for the velocity of change are $k = 0.0210$ for B and 0.0249 for A. The corresponding "half-life periods" are 33 and 28 min. A and B, upon nitration, yield the same α, α' -bromonitrocaphor, m. 104° .

C. J. WEST

Phenylcamphenol. A. M. NORDSTRÖM. *Hyllningskrift tillägnad Ossian Aschan* 1920, 129-33.—PbMgBr and camphenol give a thick oily substance, phenylcamphenol, b_{15} $166-7^\circ$, d_4^{20} 1.0620, n_D^{20} 1.55085, M 65.11 (C 82.68, H 9.18%), and a little Ph₂. Splitting off of water from the alc. gives a compound probably of the constitution



d_4^{20} 1.0002, n_D^{18} 1.54679, M 62.70, resistant to oxidation in neutral or alk. KMnO_4 but attacked by boiling acid soln.; the product could not be purified. The compd. adds Cl_2

with great difficulty and forms no nitrosochloride. Treatment with HCO_2H gives phenylapobornyl formate, a thick oil b_{15} 183.5–5°, d_4^{20} 1.0801, n_D^{20} 1.53461, M 70.10 (C 78.76, H 8.24%). Sapon. of the ester gives a semi-fluid substance phenylapoborneol, b_7 164.5–6°, d_4^{25} 1.0583, n_D^{25} 1.55160, M 65.18 (C 83.50, H 9.20%), and an acid crystg. in fine needles, $m.$ 164°. Oxidation of the phenylapoborneol, which is difficult, gives phenylapocamphor, b_{10} 185–7°, d_4^{22} 1.0716, n_D^{20} 1.55228, M 63.78 (C 84.04, H 9.18%). With semicarbazide the camphor forms a semicarbazone, $m.$ 214°. Oxidation of the phenylapocamphor gives phenylapocamphoric acid crystg. in shiny scales $m.$ 205°. Phenylapoborneol gives according to Chugaev phenylapobornylene, b_{15} 135°, d_4^{20} 0.9907, n_D^{19} 1.54466, M 63.16 (C 90.93, H 9.04%), and a little by-product, b_7 70–4°, d_4^{21} 0.9108, n_D^{17} 1.53619, M 67.59 (C 90.59, H 9.10%), which on oxidation forms BzOH and a ketone whose semicarbazone $m.$ 199°. Phenylapobornylene adds Cl with difficulty but forms with ease a nitrosochloride $m.$ 164°. Oxidation of the above products with alk. KMnO_4 gives the same acid as the oxidation of phenylapocamphor. The acid forms an anhydride $m.$ 118–9°. Phenylapocamphoric acid with EtOH and H_2SO_4 gives a diethyl ester, b_7 200–1°, d_4^{20} 1.7028, n_D^{18} 1.50596, M 87.88 (C 71.86, H 8.01%).

C. E. CARLSON

Colophenic acids. Answer to Mr. W. Fahrion, also an addendum, OSSIAN ASCHAN. *Ber.* 55B, 1–3(1922); cf. C. A. 15, 3097.—A. cannot agree with F. (C. A. 16, 925) that his (A.'s) isolated colophenic acids are identical with F.'s "oxyabietic acids," which were obtained by autooxidation of finely powdered colophony in the air and are doubtless mixts. of a large no. of substances; in fact, it would be more proper to designate them as "oxidized colophony" rather than "oxyabietic acids." A. is for the present unable to continue his study of these substances and desires to call attention to the fact that since the publication of his last paper he has found a further technical application for the colophenic acids, viz., as *lacquers*. Their EtOH and MeOH solns. leave on drying a solid film which comes out especially beautiful on polished wood and becomes very hard in the air.

C. A. R.

Diphenyl derivatives. II. Derivatives of aminodiphenyl. A. GARCÍA BANÚS AND JUAN FERRER TOMÁS. *Anales soc. españ. fis. quim.* 19, 293–312(1921).—By methylation of $4\text{-H}_2\text{NC}_6\text{H}_4\text{Ph}$ by Me_2SO_4 and 30% NaOH , 4-dimethylaminodiphenyl (A), $m.$ 117–9°, was obtained in fair yield. About 8 hrs. were required for the reaction. A did not condense with BzH in presence of ZnCl_2 . With Mischler's ketone and POCl_3 a green dye was produced which faded in a few hrs. By nitration of 11 g. A at –5° with dil. HCl and 5 g. NaNO_2 , 10 g. crude 3-nitro-4-dimethylaminodiphenyl (B) was obtained. Recrystd. from Et_2O , B formed deep red monoclinic crystals about 3 cm. long by 1 cm. thick (complete geometrical and optical data are given). B gives a yellow soln. in non-ionizing solvents (PhH or petr. ether) and deep red solns. in ionizing solvents (AcOH , EtOH , MeOH). It dissolves in concd. HCl or hot 30% H_2SO_4 , forming colorless solns. which upon diln. ppt. the base as a red powder. The hydrochloride of B was pptd. in silky needles by passing HCl gas into B in Et_2O soln. Upon evapn. of the Et_2O it instantly decompd. into the base and HCl gas. With CrO_3 , B yielded BzOH . KMnO_4 removed one Me , forming 3-nitro-4-methylaminodiphenyl (D), red crystals $m.$ 112–3°. B was also obtained almost quant. by nitrating 0.5 g. A with a mixt. of 1 cc. HNO_3 (d. 1.52), and 1 cc. AcOH . From 5 g. A, 15 cc. HNO_3 , and 40 cc. AcOH , 7.5 g. of what was apparently 3,5,2',4'-tetranitro-4-dimethylaminodiphenyl (C) was obtained, nearly insol. in Et_2O , crysts. from EtOH in large needles, $m.$ 122°. C was also obtained by nitrating B in a similar manner. With SnCl_2 and concd. HCl B yielded 3-amino-4-dimethylaminodiphenyl, fine silky crystals turning violet in the air, $m.$ 59–60°, b_{15} 200°, sol. in hot H_2O and all the common org. solvents. The hydrochloride

ride in H_2O gives an intense red color with $FeCl_3$ or $K_2Cr_2O_7$; excess of the latter ppts. a brown resin. *Acetylaminodiphenyl* (E), m. 170° , was prepd. from $4-H_2NC_6H_4Ph$, $AcOH$, and Ac_2O . From 27 g. E, 231 cc. $AcOH$, and 28 cc. HNO_3 (d. 1.52) was obtained 29 g. 3-nitro-4-acetylaminodiphenyl, m. $130-2^\circ$, which when boiled with 8% alc. $NaOH$ yielded 3-nitro-4-aminodiphenyl (F), m. $168-70^\circ$. F does not react with Me_2SO_4 ; in a sealed tube with MeI at $140-60^\circ$ it slowly forms D. From F with $SuCl_2$ and concd. HCl was obtained 3,4-diaminodiphenyl, gray scales, m. $102-3^\circ$, soluble in hot H_2O , gives an intense red color with $FeCl_3$, a violet to brown ppt. with $K_2Cr_2O_7$, and a green \rightarrow brown \rightarrow white ppt. with HNO_3 .

L. E. GILSON

Molecular configurations of polynuclear aromatic compounds. I. The resolution of γ -6,6'-dinitro- and 4,6,4',6'-tetranitrodiphenic acids into optically active components. GEO. H. CHRISTIE AND JAMES KENNER. *J. Chem. Soc.* 121, 644-20 (1922).—Kaufer (C. A. 1, 1396) suggested that the C_6H_5 nuclei of the 2 Ph residues in Ph_2 and derivs. are situated in 2 parallel planes. Kenner and Mathews (C. A. 9, 206) have pointed out that this may represent a configuration which Ph_2 may assume under certain conditions but that it is not necessarily its normal one. The present work indicates the resolvability of derivs. of Ph_2 and thus it seems to follow that the 2 C_6H_5 nuclei are not coplanar. γ -6,6'- $[C_6H_3(NO_2)(CO_2H)-]_2$ was resolved by means of brucine. *Brucine d*- γ -6,6'-dinitrophenate, the less sol. form, crystals as radiate clusters of plates with 8.5 H_2O from H_2O , m. 261° (decompn.). The anhydrous salt showed $[\alpha]_D$ 61.2° in 1.88 % $CHCl_3$ soln. and another sample 60.42° in 2.55 % $CHCl_3$ soln. 1 part dissolves in 375 cc. boiling H_2O and in 3750 cc. at ordinary temp. Removal of the brucine with H_2SO_4 gave the *d*-acid, m. $230-1^\circ$; a 1.82 % soln. of the Na salt showed $[\alpha]_D$ 225.3°. The *brucine l*-salt, sol. in 95 parts boiling H_2O , m. $207-8^\circ$ (decompn.), and contains 4 H_2O . The anhydrous salt in 1.44 % $CHCl_3$ soln. showed $[\alpha]_D$ -43.67°. The free *l*-acid was obtained by decompn. of the salt with 0.2 N NH_4OH , m. $230-8^\circ$, and showed, as the Na salt, $[\alpha]_D$ -109.7° in 0.09 % soln. Partial racemization occurs on standing. *Brucine d*-4,6,4',6'-tetranitrodiphenate, the less sol. salt, forms yellow, 5-sided plates, m. 252° (decompn.). 1 part dissolves in approx. 3500 cc. boiling H_2O . A 1 % soln. in 10.4 N $AcOH$ had $[\alpha]_D$ 22.17°. The *brucine l*-salt, m. $196-7^\circ$, crystals with 2.5 H_2O , dissolves in approx. 1500 cc. boiling H_2O , and a 1 % soln. in 10.4 N $AcOH$ had $[\alpha]_D$ -39.37°. The *l*-acid, m. $281-2^\circ$, showed, as the Na salt in 1 % soln., $[\alpha]_D$ -19.28°; but after some days the rotatory power was 0. This would indicate that partial racemization had occurred during the prepn. of the active acid. *Brucine d*-4,6,4',6'-tetranitrodiphenate, square, rectangular plates from C_6H_6 , m. 103° , with evolution of C_6H_4 , then m. 125° . The Me ester also 1st seps. from C_6H_6 with solvent of crystn., m. 148° , from $C_6H_5Me_2$ in large yellow prisms, m. 152° , and from $MeOH$ in needles, m. 169° .

C. J. WEXR

The condensation of benzene and chloral hydrate in the presence of aluminium chloride. MARC VAN LAER. *Bull. soc. chim. Belg.* 28, 346-50 (1919).— CCl_3CHPh_2 obtained as one of the products of condensation of C_6H_6 and $CCl_3CHO \cdot H_2O$ in the presence of $AlCl_3$, apparently undergoes partial condensation, giving a resin which has the constitution of a HCl salt of $C_6H_4(CCl_3CHPh_2)_2$. At the same time, some of the CCl_3CHPh_2 condenses with more C_6H_6 to give α -chloro- $\alpha,\alpha,\beta,\beta$ -tetraphenylethane.

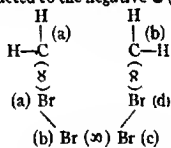
J. C. S.

Unsymmetrical addition to the double bond. I. A theory of the reaction mechanism of the direct union. G. A. PERKINS. *Philippine J. Sci.* 19, 645-60 (1921).—In accordance with Langmuir's octet theory, P. formulates a theory for the reaction mechanism of the direct bond, based on the following definitions. An external influence acting on an unshared electron in shell C of compd. A-B-C moves it from its position of equil. and a force of restitution is developed which is directly dependent upon each nucleus and electron in the mol. Similarly the constraint developed by an electron

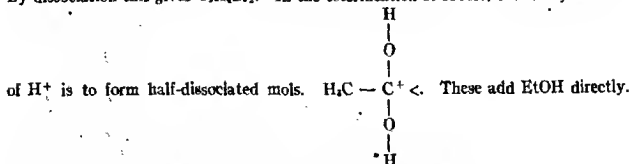
shared by C and D, in A-B-C-D-E-F, may be considered as the resultant of single strains originating resp. in A-B-C- and in -D-E-F. When an electron is moved beyond the point of max. constraint, it is no longer within the shell. Such max. points constitute a dissociation or shell boundary. The equil. position of a firmly held electron is well within the shell boundary. A shared or loosely held electron is near the boundary and requires a much smaller force to move it through the same distance. The strength of union of 2 atoms bound by shared electrons is measured by the rapidity with which the binding force increases when the atoms are pulled apart. When 2 shell boundaries intersect, a concn. of neighboring electrons occurs in the common sector. These serve as binding electrons (1 to 6 in number) and form, in general, pairs. The 3-electron bond is stable in certain cases (cf. *C. A.* 16, 667) e. g., in C_6H_6 . Four electrons (a double bond) form 2 pairs, whose constraints make independent rotation impossible without dissociation. The radial displacement due to the increased repulsion of the kernels brings electrons nearer shell boundaries. Large empty shell spaces occur. Instability of the triple bond is also due to extensive displacement. Two atoms may dissociate so that 1 electron goes to each shell. Usually such weak bonds are unsym. and both electrons go to one atom $A-B \rightarrow A^+ < +B^-$. In direct addition, electrons are added to a complete shell. This is possible when extensive displacement of electrons leaves large electron-free spaces. The resulting unstable mol. rearranges. Org. reactions consist of (1) direct addition before dissociation, and (2) dissociation, usually unsym., before addition. Addition of Br₂ to C_2H_4 occurs following the penetration of Br electrons into

the empty spaces of one C atom (a): $Br-Br^+ \propto \begin{array}{c} H & H \\ (b) & (a) \\ C & C \\ | & | \\ H & H \end{array} \propto C^-(b)$. The subsequent loos-

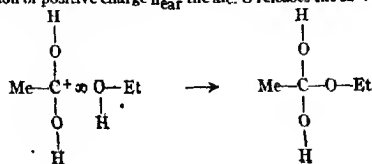
ing of restraints causes C atom (b) to pull 1 pair of electrons outside shell (a). A general shift of electrons causes empty spaces in Br (b) into which another Br₂ mol. penetrates. The latter (positive ion) is attracted to the negative C (b).



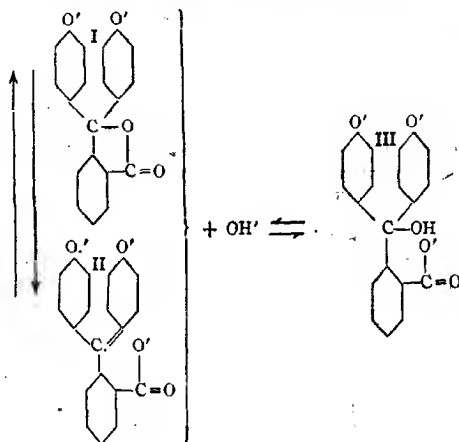
By dissociation this gives $C_2H_4Br_2$. In the esterification of HOAc, the catalytic effect



The accumulation of positive charge near the alc. O releases the H^+ .



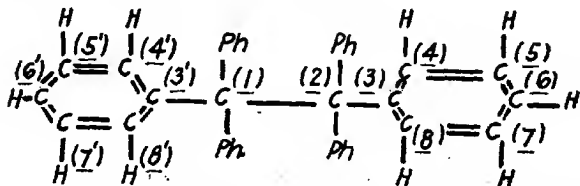
Mechanism of the color change of some phthaleins. A. THUN. *Z. physik. Chem.* 100, 479-88(1922).—As one of the consequences of a no. of relations developed between the lactoid and quinonoid forms, I and II, of the secondary anions of phthaleins, the sensitiveness of phthalein indicators depends on the fact that the secondary ions change into tertiary ions of non-quinonoid character, in accordance with the accompanying



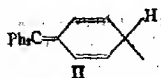
scheme. The question of whether form I or II changes into form III by taking up OH' is discussed. While on stereochem. grounds it is probable that it is form I that combines with OH' , an investigation of the kinetics of the reaction of decolorization has been commenced to decide between the 2 possibilities.

H. JERMAIN CREIGHTON

The dissociation of hexaphenylethane from the viewpoint of the octet theory of valence. H. I. COLE. *Philippine J. Sci.* 19, 681-90(1922).—Gomberg's hypothetical structures of the equil. mixt. "hexaphenylethane," is confirmed by Langmuir's valence theory. The normal structure of Ph_6C_2 is I.



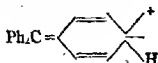
The electrons shared between C (1) and (2) are very firmly held by both atoms, since the remaining 6 have been drawn away from the kernel (cf. preceding abstr.). Therefore dissociation cannot occur without rearrangement in Ph groups. In non-ionizing solvents dissociation is sym., an electron joining (3) and (4) being transferred to (3). Position C (1) now has 9 electrons, (1) and (2) therefore separate sym. and a double (II) is formed between (2) and (3) (Gomberg's formula).



These two neutral quinonoid mols. are not identical with triphenylmethyl. In ionizing solvents, unsym. dissociation occurs, owing to solvent mols. uniting with C (6). A quinonoid rearrangement occurs whereby 2 electrons are supplied by the ring to the (2), (3) position. C (2) with 10 electrons yields 2 to C (1), forming $\text{Ph}_3 \equiv \text{C}^+$, a colored positive ion, and III, a colorless negative ion.



III



IV

C (6) may unite with C (1), giving IV. The 6 negative groups on C (1) and (2) may leave electron-free spaces in mols. into which O can penetrate, followed by dissociation into Ph_3C^- and C^+ ; Ph_3 . A shift of electrons may transfer the positive area to the O



which then reunites with the negative ion, thus accounting for the ready oxidation of mol. I. Reduction of I may be due to the transfer of the free electrons from Zn to the org. mol. These negative ions $\text{Ph}_3 \equiv \text{C}^-$ then combine with H^+ from acid. Cl and Br electrons enter the free spaces of II, followed by a rearrangement of electrons, giving a benzenoid form.

I. P. ROLF

Hydrindones. FRITZ VON KONEK. I. The hydrindone of the vanillin series.

FRITZ VON KONEK AND NIKOLAUS SZAMÁK. *Ber.* 55B, 102-9 (1922).—The object was to det. whether satd. phenol acids contg. a 2nd nucleus substituent can still undergo the Miller and Rohde condensation to hydroxyhydrindones. Ferulaic acid, faintly yellowish needles from H_2O , m. 169° , was obtained in 7.5 g. yield from 10 g. vanillin boiled 15-6 hrs. with 16 g. anhyd. NaOAc and 30 g. Ac_2O , with subsequent hydrolysis of the resulting Ac deriv. with excess of boiling KOH ; in H_2O with excess of 2% Na-Hg it gives hydroferulaic acid, needles from C_6H_6 -ligroin (1 : 5), m. 90° , 5 g. of which dissolved in 70 g. concd. H_2SO_4 at 140° and at once poured upon ice, gives 1-1.5 g. 5-methoxy-6-hydroxy-1-keiodihydrindone (A), fine long needles from H_2O , m. $193-4^\circ$; phenylhydrazone, faintly yellowish needles from alc., m. $205-10^\circ$ (decompn.). Attempts to prove the structure of A by oxidation with HNO_3 of all degrees of concn. up to the red fuming acid in no case gave a sufficient amt. of a product for identification. With Me_2SO_4 in excess of alkali, however, it yields 5,6-dimethoxy-1-hydrindone, needles from PhMe-ligroin, m. $116-7^\circ$, identical with that obtained by Perkin and Robinson from veratric aldehyde (C. A. 2, 109), showing that in the formation of A the closure of the ring occurs in the *p*-, not the *o*-position to the MeO group in the hydroferulaic acid. C. A. R.

Some chloronaphthalene derivatives. P. FRIEDLÄNDER, S. KARAMESSINIS AND O. SCHENK. *Ber.* 55B, 45-52 (1922).—When hot HCl solns. of nitronaphthalene- α sulfonic acids are treated with NaClO_4 , the SO_3H group is replaced by Cl . The reaction is not quite quant.; even with the calcd. amt. of Cl or NaClO_4 , it is hardly possible to avoid oxidation reactions resulting, apparently, in the formation of chlorinated quinones. As these by-products, however, can easily be sepd. from the main products by treatment with alkalis and the starting materials are easily available and the chlorination proceeds rapidly and smoothly, the method is well adapted for the prepn. of nitrochloronaphthalenes. 1,5- $\text{C}_{10}\text{H}_6(\text{NO}_2)\text{Cl}$, needles from dil. alc. or AcOH , m. 111° , is obtained in 25 g. yield from 80 g. 1,5- $\text{C}_{10}\text{H}_6(\text{NO}_2)\text{SO}_3\text{Na}$ in 1 l. H_2O , 200 cc. HCl (22°Bé.) and 200 cc.

di- or trichlorobenzene at 90-5° treated dropwise with 15 g. NaClO_4 in 200 cc. H_2O and allowed to stand about 1.5 hrs.; with SnCl_4 or Fe-AcOH it gives 5-chloro-1-naphthylamine, long needles from dil. alc. or ligroin, m. 85°, whose acetyl derivative, 6-sided prisms from ligroin, m. 128°. The crude NO_2 compd. contains small amts. of 1,4,5- $\text{C}_{10}\text{H}_6\text{Cl}_3$, fine needles from alc., m. 133°, which remains undissolved after the reduction and treatment with HCl . 1,8- $\text{C}_{10}\text{H}_6(\text{NO}_2)_2\text{Cl}$ is similarly obtained. 2-Nitronaphthalene-4,8-disulfonic acid is the chief product, together with a little of the 1- NO_2 deriv. (from which it is sepd. by salting out), of the nitration of 1,5- $\text{C}_{10}\text{H}_6(\text{SO}_3\text{H})_2$; the sodium salt sepa. from H_2O in fine needles, the barium salt as a yellowish cryst. ppt.; the Na salt in dil. HCl at 90-5° with NaClO_4 yields 2-nitro-4,8-dichloronaphthalene, long yellowish needles from C_6H_6 , m. 132°, reduced by SnCl_4 or Fe-HCl to the amine, needles from dil. alc., m. 132-3°; the hydrochloride is hydrolyzed by much H_2O and is insol. in excess of dil. HCl ; acetyl derivative, needles, m. 265°; diazonium sulfate, prepd. in concd. H_2SO_4 , faintly yellowish needles, couples normally with phenols, naphthols, etc. to azo compds. differing from the corresponding β -isomers in their lesser soly. and somewhat more bluish tinge; the diazonium salt boiled with dil. H_2SO_4 gives 4,8-dichloro-2-naphthol, needles from alc., m. 159-9°, whose azo derivs. are less sol. than the β -isomers but of a more yellowish tinge and whose methyl ether, almost odorless needles, m. 93°. 2,4,8-Trichloronaphthalene, from the diazonium salt with HCl and CuCl , yellowish needles from alc., m. 94°. 1-Nitro-4-chloronaphthalene-8-sulfonic acid (A), the sole product of the nitration of 1,5- $\text{C}_{10}\text{H}_6\text{ClSO}_3\text{H}$ (from diazotized 1,5- $\text{C}_{10}\text{H}_6(\text{NH}_2)\text{SO}_3\text{H}$ and CuCl or by sulfonation of 1- $\text{C}_{10}\text{H}_7\text{Cl}$ at 150°) in 2-3 parts H_2SO_4 (60° B ϕ) (digested until the HCl is removed) at 10-20° with the calcd. amt. of $\text{HNO}_3\text{-H}_2\text{SO}_4$, yellowish needles, reduced to the 1-amino acid, rhombs which on diazotization and boiling yield a soda-insol. chloronaphthosulfone, fine needles from AcOH , m. 178°, sol. in NaOH with formation of 1-naphthol-4-chloro-8-sulfonic acid, which with Na-Hg gives 1,4- $\text{C}_{10}\text{H}_6(\text{OH})\text{Cl}$, m. 120°. 1-Nitro-4,8-dichloronaphthalene, from 1,4,8- $\text{C}_{10}\text{H}_6(\text{NO}_2)(\text{SO}_3\text{H})_2$ or A, yellowish needles from alc. or ligroin, m. 142°, somewhat volatile with steam, reduced by SnCl_4 or Fe-HCl to the amine, fine long needles from very dil. alc., m. 113°; acetyl derivative, m. 163°. 1,5,8- $\text{C}_{10}\text{H}_6(\text{NO}_2)_3\text{Cl}$, from the mixt. of nitro-1-chloro-naphthalene-4-sulfonic acids obtained by nitrating 1,4- $\text{C}_{10}\text{H}_6\text{ClSO}_3\text{H}$, yellowish needles from alc. or ligroin, m. 93° (yield, 50%, calcd. on the basis of the original $\text{C}_{10}\text{H}_7\text{Cl}$); amine, m. 104°; acetyl derivative, 6-sided prisms from alc. or AcOH , m. 202°. That nitration of 1,4- $\text{C}_{10}\text{H}_6\text{ClSO}_3\text{H}$ yields a mixt. is shown by treating the product with Fe and a little HCl or AcOH ; this yields chiefly (56 g. from 50 g. $\text{C}_{10}\text{H}_7\text{Cl}$) the H_2O -sol. 8-amino acid (reduced by Na-Hg to 1,8- $\text{C}_{10}\text{H}_6\text{ClNH}_2$, m. 93-4°), and about 10 g. of the less sol. 5-amino acid giving on diazotization and boiling a chloronaphthosulfone, fine needles from dil. alc., m. 184°. 1,8-Dinitronaphthalene-4-sulfonyl chloride, from the Na salt and PCl_5 , yellowish needles from C_6H_6 -ligroin, m. 152.5°; the Na salt in HCl with NaClO_4 gives 1,8,4- $\text{C}_{10}\text{H}_6(\text{NO}_2)_3\text{Cl}$, m. 180°. 1,8,3,6- and 1,5,3,7- $\text{C}_{10}\text{H}_6(\text{NO}_2)_4(\text{SO}_3\text{H})_2$ give no ppt. on similar treatment with NaClO_4 .

C. A. R.

α -1-Naphthylethylamine. E. SAMUELSSON. Svensk Kem. Tids. 34, 7-9 (1922).—Me naphthyl ketones were prepd. by the Friedel-Crafts reaction, giving a yield of 75%. Of this 50 to 70% was the α -isomer regardless of the temp. at which it was prepd. (0° to 50°). In no instance did the α -compd. come out pure but a prepn. consisting exclusively of the β -form was obtained when the reaction took place in PhNO_2 . α - $\text{C}_{10}\text{H}_7\text{COME}$ with an excess of NH_4OH gave an oxime, m. 135°. The consistency of the oxime crystals was not the same when the EtOH solns. were acid as when alk. during the reaction. Isomers are suggested [see Betti and Poccianti, C. A. 8, 3021; 9, 2089.]. α - $\text{C}_{10}\text{H}_7\text{CHMeNH}_2$ is a colorless liquid, b. 153°, d_4^{20} 1.063. (The β -isomer is also a colorless liquid b. 153°). The optically inactive substance was resolved into active forms by means of camphoric

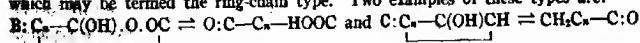
acid. The *d*-naphthylethylamine was not sufficiently pure for measurements. The other forms gave the following rotations; liquid $[\alpha]_D^{25} -80.8^\circ$, $[M]_D^{25} -133.2^\circ$, and in H_2O , $[\alpha]_D^{25} -62.5^\circ$. Salts with HCl and $H_2C_2O_4$ were prepd. A. R. ROSA

Naphthalenesulfonic acids. IV. Solubilities of some amino salts of naphthalenesulfonic acids. H. WALKER. *J. Ind. Eng. Chem.* 14, 817-8(1922).—The solys. of the α - and β - $C_{10}H_7NH_2$ salts of 1,5-, 2,6-, 2,7- and 1,6- $C_{10}H_6(SO_3H)_2$ and α - and β - $C_{10}H_7SO_3H$ were detd. from 26 to 98°. Because of hydrolysis with pure water the solvent used was 0.01 N HCl. The most sym. of the isomers form the least sol. salts. The curve for α -naphthylamine naphthalene- β -sulfonate indicates an allotropic change at 54°, and that for α -naphthylamine naphthalene- α -sulfonate one at about 66°. G. W. S.

L. The exhaustive sulfonation of naphthalene. II. 1,3,6,8-Nitrotrisulfonic acid. FRITZ SCHMID. *Diss. Eidgen. Techn. Hochschule, Zürich* 1920.—The sulfonation of $C_{10}H_8$ was studied by prepn. of the total sulfonyl chlorides of the products and sepn. of the same by fractional crystn. The end-products of exhaustive sulfonation, aside from traces of by-products, were found to be 1,3,6- $C_{10}H_4(SO_3H)_3$ (A) and 1,3,5,7- $C_{10}H_4(SO_3H)_4$ (B), as would be expected by the rule of Armstrong and Wynne. The stability of A toward excess SO_3 proved it to be a final end-product; no isomer of B could be detected. Conditions of sulfonation yielding during the earlier stages more 1,5- $C_{10}H_6(SO_3H)_2$ yield more B in the final stages; when more 1,6- $C_{10}H_6(SO_3H)_2$ is formed at the beginning more A is yielded at the end. B is abundantly formed at 140–150°. The Ba salt of B is dimorphous, crystg. with 8 or 14 mols. H_2O , depending upon the temp. $C_{10}H_4(SO_3)_4Ba_2 \cdot 14H_2O$ is formed at 15°, as efflorescent, blunt, transparent prisms; $C_{10}H_4(SO_3)_4Ba_2 \cdot 8H_2O$ is formed at 35° and is stable in the air. The 2 forms could be mutually transformed one into the other and yielded the same sulfonyl chloride, m. 261–2°, identical with that of B. This dimorphism of the Ba salt accounts for the erroneous reporting of a second tetrasulfonic acid. Quant. study of the sulfonation and nitration processes revealed that low yields under certain conditions may be attributed to the formation of B, which cannot be nitrated, as well as to complete destruction of part of the $C_{10}H_8$. The 1,3,6,8-nitrotrisulfonic acid was isolated, by pptg. from concd. soln. with HCl, as pale yellow, fine, hygroscopic needles. It contains H_2O of crystn., which is partially lost by standing over H_2SO_4 ; it is stable toward boiling for 1 hr. with dil. acid. The following salts were identified: $[C_{10}H_4NO_2(SO_3)_3]_2Pb \cdot 8H_2O$, thick, orange-yellow needles; $[C_{10}H_4NO_2(SO_3)_3]_2Ba \cdot 8H_2O$, efflorescent, hemispherical, yellow knobs; $C_{10}H_4NO_2(SO_3Na)_3 \cdot 6H_2O$, blunt, orange-yellow needles or prisms, stable in air; $C_{10}H_4NO_2(SO_3H)_3(PhNH_2)_2 \cdot 2.5H_2O$, fine colorless needles. P. R. DAWSON

The hydrogenation of naphthalene. R. C. FURNESS. *Chem. Abs. (N. Y.)* 30, 173-6(1922).—A résumé of the com. synthesis and applications of tetra- and decahydronaphthalenes (tetralin and decalin; cf. C. A. 14, 357, 1227, 1901). Tetralin is now produced on a com. scale by the Tetralin Gesellschaft m.b.H. at Rodleben, Ger., with a daily production of 100–120 tons. It is used chiefly mixed with or in place of gasoline as a motor fuel and as a turpentine substitute. C. C. DAVIS

Ring-chain tautomerism. I. The occurrence and effect of keto-enol tautomerism between a ring compound and its open-chain isomeride. GEO. A. R. KON, ARNOLD STEVENSON AND J. F. THORPE. *J. Chem. Soc.* 121, 650-65(1922).—Continuation of work reported in C. A. 15, 1279 has led to an investigation of a new type of tautomerism, which may be termed the ring-chain type. Two examples of these types are:



Under favorable conditions tautomerism of both types B and C can occur. The substance described below can exhibit ring-chain tautomerism of both types, B when the lactone ring is capable of existence and C when its formation is prohibited by the presence of alkali. Another example may be the acid of Balbiano (*Ber.* 27, 2133). *ac-1-*

Keto-3-methyltetrahydronaphthalene-3-acetic acid, upon oxidation with 1% KMnO_4 or 50% HNO_3 , gives the lactone of *ac-1-keto-2-hydroxy-3-methyltetrahydronaphthalene-3-acetic acid* (C'), large plates, m. 171° , colorless when solid but yellow in soln. in H_2O or non-aq. solvents. Conc'd. H_2SO_4 gives a bright orange soln., which becomes colorless on diln. Silver salt. Acetate, thick, square plates, m. 142° . Quinoxaline, plates, m. 177° . Semicarbazone, pale yellow plates, m. 212° (decompn.). Oxime, minute prisms, m. 183° . *p*-Nitrophenylhydrazones, small, thick, orange plates, m. 190° . On further oxidation of C' with H_2O_2 in Na_2CO_3 soln., α -*o*-carboxybenzyl- α -methylsuccinic acid was obtained, microprisms, m. 187° (decompn.). C', heated with an excess of 10% NaOH for 2 or 3 hrs., gave the lactone of 3-hydroxy-2-*o*-carboxybenzyl-2-methylcyclopropane-1-carboxylic acid (D), small plates, m. $187-8^\circ$. Silver salt. It effervesces with aq. NaHCO_3 , and does not react with AcCl or with $\text{H}_2\text{NCONHNH}_2$. On further oxidation both C' and D give a substance, $\text{C}_{14}\text{H}_{16}\text{O}_4$, m. 210° , the acetate of which m. $218-9^\circ$. It does not react with $\text{H}_2\text{NCONHNH}_2$. Balbiano's acid (α -keto- β,β,γ -trimethylsuccinic acid (E)) reacts with *o*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$ to form a substance, $\text{C}_{14}\text{H}_{16}\text{O}_4\text{N}_2$, m. 148° , which, heated a few degrees above its m. p., forms a substance, $\text{C}_{14}\text{H}_{16}\text{O}_4\text{N}_2$ (loss of H_2O), gray scales, m. $223-4^\circ$, also formed by boiling E and *o*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$. On heating E, CO was evolved, and trimethylsuccinic anhydride was isolated from the reaction product. α -Ketoglutaric acid (F) and *o*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$ form an addition product, $\text{C}_{11}\text{H}_{16}\text{O}_4\text{N}_2$, small needles, m. 155° . That from α,α -dihydroxy- β,β -dimethylglutaric acid (G) forms small prisms, m. 237° . The residue formed after heating with H_2SO_4 contains dimethylsuccinic anhydride. The vol. of CO in l. evolved from 1 g.-mol. of acid without and with H_2SO_4 is as follows: E, 16.1, 39.9; F, 6.9, 30.2; G, 12.9, 37.6; α -keto- β,β -diethylglutaric acid, 11.9, 38.9; theory for 1 CO, 22.3. This work makes it appear that in the trimethyl-substituted glutaric acid there is present just the necessary condition to enable tautomerism of both type B and C to occur. C. J. WEST.

Diaminoanthraquinones. M. BATTEGAY AND J. CLAUDIN. *Bull. soc. ind. Mulhouse* 87, 71-2 (1921).—When 1,3-dibromoanthraquinone (C. A. 15, 2439) is treated in PhNO_2 with K_2CO_3 , and powd. Cu, 1,3-dilolylsulfonylaminoanthraquinone, $\text{C}_{14}\text{H}_{10}\text{O}_2(\text{NH}_2\text{SO}_2\text{C}_6\text{H}_4\text{Me})_2$, m. 245° , is obtained. This dissolves in cold 96% H_2SO_4 with an orange-red color, and when this soln. is heated on the water bath for 1 hr. and then poured into NH_4OH , brick-red flakes of 1,3-diaminoanthraquinone are pptd. This can be crystd. from PhNO_2 as red crystals having a black reflex and m. 290° . The di-Bz deriv. m. $>300^\circ$ and, although insol. in alc. and only slightly sol. in other usual solvents, can be obtained as brown crystals from PhNO_2 sol. in cold conc'd. H_2SO_4 with an orange color. 1,6- and 1,7-Diaminoanthraquinones were obtained by treatment of the corresponding nitroanthraquinonesulfonic acids with NH_3 under pressure. Both were crystd. from anisole. 1,6-Diaminoanthraquinone forms red spangles, m. 292° , and the di-Ac and di-Bz derivs. m. 295° and 275° , resp. The latter substance dissolves in cold conc'd. H_2SO_4 with a red color. 1,7-Diaminoanthraquinone forms red needles, m. 290° , and the m. p. of the di-Ac and di-Bz derivs. are 283° and 325° , resp. The latter substance dissolves in cold conc'd. H_2SO_4 to give an orange color. Both the 1,6- and 1,7-diaminoanthraquinones are easily transformed into the corresponding dihydroxyanthraquinones by diazotization and boiling with water. J. C. S.

Elimination of aromatically bound hydrogen, with combination of aromatic nuclei, by aluminium chloride. III. ROLAND SCHOLL AND CHRISTIAN SEHR. *Ber.* 55B, 100-17 (1922); cf. C. A. 7, 790.—That the failure to obtain a benzanthrone from α -naphthyl *o*-chlorophenyl ketone (A) by heating with AlCl_3 was probably due to the coming of Cl atom, as the result of secondary valences, into the closest proximity with the β - or *peri*-C atom of the C_{10}H_7 nucleus is indicated by the fact that while the *m*- and *p*-Cl isomers of A give chlorobenzanthrones the yields are considerably smaller than that of ben-

anthrone obtained from the nonchlorinated α -C₁₀H₇COPh. A, from C₁₀H₈, *o*-ClC₆H₄COCl and AlCl₃ in CS₂, needles from MeOH, m. 82°. *m*-Isomer, light yellow prisms from alc., m. 77-9° (yield, 20 g. from 18 g. *m*-ClC₆H₄COCl and 15 g. C₁₀H₈ in 50 cc. CS₂ at 0° treated in the course of 0.5 hr. with 18 g. AlCl₃ and allowed to stand 30-40 hrs. at room temp.), sol. in concd. H₂SO₄ with golden yellow color; 5 g. with 25 g. AlCl₃ heated in the course of 2.5 hrs. to 145° gives 2 g. crude (0.5 g. pure) 6-chloro-1,9-benzanthrone (B), golden yellow needles from dil. AcOH, m. 188.7°, sol. in C₆H₆ with yellow color and no fluorescence, in PhNO₂ with very faint brown fluorescence, in AcOH with yellow color and vivid green fluorescence, in concd. H₂SO₄ with yellowish red color and blue-green fluorescence, gives on fusion with alc. KOH a dark blue dye, probably a dichloroanthrone, which from its wine-red hyposulfite vat with green fluorescence gives an alkali-fast color to cotton. Treated in H₂SO₄-H₂O suspension with 4 g. CrO₃ in AcOH and heated 1.5 hrs. on the H₂O bath 1 g. B gives 0.9 g. 6-chloroanthraquinone-1-carboxylic acid, needles with golden luster from AcOH, m. 295°, sol. in concd. H₂SO₄ with golden yellow color, sublimes without decompn. but on heating several hrs. in a closed tube at 310-20° or on distn. of its Na salt with anhyd. Ba(OH)₂ it loses CO₂ and gives 2-chloroanthraquinone, fine yellow needles from alc., m. 203-4°. α -Naphthyl *p*-chlorophenyl ketone (8 g. crude product from 12 g. *p*-ClC₆H₄COCl), columns from alc., m. 128-8°, sol. in concd. H₂SO₄ with golden yellow color; 10 g. heated with AlCl₃ gives 0.5 g. 7-chloro-1,9-benzanthrone, yellow microcrystals, m. 187-8°, depresses the m. p. of B to 150°, quite easily sol. in C₆H₆, PhNO₂ and AcOH with greenish yellow color and, in the last solvent, with faint green fluorescence, in concd. H₂SO₄ with yellow color and green fluorescence. 1-C₆H₄(CO)C₆H₄COCl, from the acid covered with POCl₃ and refluxed 1 hr. with a slight excess of PCl₅, light yellow needles, m. 203-4°; 5 g. allowed to stand 4-6 days with 3.5 g. C₁₀H₈ and 3 g. AlCl₃ in PhNO₂ gives 2.2 g. 1-anthraquinonyl α -naphthyl ketone, crystals from C₆H₆, m. 231-2°, sol. in concd. H₂SO₄ with yellow color (green on heating), is unchanged by heating with AlCl₃. IV. Ring closure in doubly benzoylated naphthalenes. ROLAND SCHOLL and HEINRICH NEUMANN. *Ibid.* 118-28.—While 1,4-C₁₀H₆Bz₂ undergoes the normal condensation to 4,5,8,9-dibenzopyrene-3,10-quinone (A), the 1,5-isomer does not; the data available are not sufficient to make it possible to det. whether any generalization underlies the negative result in the 2nd case. 1,4-Dicyanonaphthalene, obtained in 50% yield from 1,4-C₁₀H₆(SO₂Na)₂ distd. with 1.5 parts KCN, long faintly yellow needles from AcOH, m. 206°, is probably identical with the product m. 204°, obtained by Darmstädter and Wichelhaus by distg. with KCN the C₁₀H₆BrSO₃H, m. 138-9°, prepd. from α -C₁₀H₇Br and fuming H₂SO₄ (*Ann.* 152, 307 (1869)), and listed in Richter's "Lexikon" as the nitrile of γ -naphthalenedicarboxylic acid. 1,4-Dicarboxylic acid, from the nitrile boiled 15 min. with 2 parts H₂O and 6 parts concd. H₂SO₄, crystals from PhNO₂, m. 309°. Dichloride, prepd. with PCl₅, slender needles from petr. ether, m. 80°; 6.8 g. allowed to stand with 8 g. C₆H₆ and 15 g. AlCl₃ in CS₂ 3-4 days at room temp. and heated 1 hr. on the H₂O bath gives 7.2 g. 1,4-dibenzoylnaphthalene, needles from 75% AcOH, m. 106°, sol. in concd. H₂SO₄ with orange-yellow color; 4 g. stirred 1 hr. with 40 g. AlCl₃ at 130° and kept 24 hrs. at 100-10° yields 5% A, bright red needles with yellow luster from xylene, m. 365°, sol. in about 400 parts boiling xylene with yellow color and green-yellow fluorescence, in 200 parts boiling PhNO₂ with orange color and bright yellow fluorescence, in concd. H₂SO₄ with olive-green color changing through yellow to flesh color with diminishing thickness of layer, gives with hot alk. Na₂S₂O₄ a yellow-red vat showing no affinity for vegetable fibers; a soln. of a trace of A in alc. NaOH changes on boiling from red-yellow to green and immediately back to red-yellow on cooling in the air; A is insol. in NaHSO₄. Distd. in a slow current of H in an evacuated tube over Zn-pumice heated to redness, A gives 60% of 4,5,8,9-dibenzopyrene, greenish yellow

leaflets or rod-like prisms from C_6H_6 , m. $281.5-2.0^\circ$; sol. in about 500 parts boiling AcOH and 200 parts boiling C_6H_6 with blue color showing faint blue fluorescence in great dil.; sol. in concd. H_2SO_4 with blue color and strong red fluorescence and changing slowly at room temp., quickly on heating, back into A. Moist amorphous A (as obtained by pouring a soln. in concd. H_2SO_4 into H_2O and washing the ppt. until neutral) treated in boiling AcOH with twice the calcd. amt. of CrO_3 gives 60% of 1,2- or *ang-phthalyl-anthraquinone* (1,2,3,4- or *ang-diphthalylbenzene*), yellow leaflets from AcOH- $PhNO_2$ (10:1), m. 325° , difficultly sol. in the usual solvents with yellow color and no fluorescence, in about 100 parts boiling C_6H_5N , in concd. H_2SO_4 with yellow color, gives in alk. $Na_2S_2O_4$ an orange-red vat-like soln. having no affinity for unmordanted vegetable fibers and giving with air first a blue-green, then an almost colorless reddish ppt. regenerating the original yellow product on acidification, does not react with $NaHSO_3$ or *o*-diamines, but 0.2 g. boiled 1 hr. in C_6H_5N with 1 cc. $N_2H_4 \cdot H_2O$ gives 0.1 g. of the *azine* (*di-peri-dibenzoylenephthalazine*), sublimes under 11 mm. in CO_2 at $360-420^\circ$ in needles sepp. from $PhNO_2$ in orange-red microneedles with golden luster, darkens in H about 430° , decomp. about 440° , very difficultly sol. in the usual solvents with orange-red color, in about 500 parts boiling $PhNO_2$, in concd. H_2SO_4 with orange-red color, gives with alk. $Na_2S_2O_4$ a cherry-red vat-like soln., showing no appreciable affinity for unmordanted vegetable fibers. $1,5-C_{10}H_6(CN)_2$, m. 260° , is obtained in 35% yield from $1,5-C_{10}H_6(SO_3K)_2$ distd. with 1.5 parts KCN; $1,5-C_{10}H_6(CO_2H)_2$, needles from $PhNO_2$, m. $315-20^\circ$ (decomp.); the dichloride with C_6H_6 and $AlCl_3$ in $PhNO_2$ gives 75% *1,5-dibenzoylnaphthalene*, crystals from AcOH, m. $185-6^\circ$, sol. in concd. H_2SO_4 with yellow color.

C. A. R.

The halogenated isatins. EUGÈNE GRANDMOUGIN. *Compt. rend.* 174, 620-3 (1922); cf. C. A. 16, 1092.—The halogenated isatins obtained by oxidizing the halogenated indigos in AcOH with HNO_3 or CrO_3 cryst. colorless to red-orange, depending on the position and number of halogen atoms, sublime without decompn., give red-orange solns. with concd. H_2SO_4 . The β -phenylhydrazones are colorless to intense yellow crystals insol. in H_2O , forming red solns. in H_2SO_4 . The β -oximes are less colored and form dark green solns. in H_2SO_4 . The m. ps. of the 5,7- and 4,7-dichloro-, 4-chloro-5-bromo-, 5,7-dibromo-, 4,5,7-tribromo-, and 4,5,6,7-tetrachloroisatins and of their oximes and phenylhydrazones and the position of the absorption bands in their spectra are given. The phys. const. of these compds. are so similar, that chem. means must be used for their identification.

T. E. DUNLAP

Some triazoles (in connection with the communication of E. Fromm). F. ARNDY, with E. MILDE, F. TSCHENSCHER, F. BIELICH and G. ECKERT. *Ber.* 55B, 12-8 (1922).—F. has submitted to A. the proofs of the forthcoming *Ann.* article referred to by F. in C. A. 16, 1429, and A. finds that only a few of the expts. therein described duplicate those carried out in his own lab. However, he will start no new series of expts. in this field and will continue those already started only insofar as is necessary to round out the dissertations of his students. As regards F.'s remarks on the prepn. of iminothiourea (A) and dithiourea (B) from perthiocyanic acid and N_2H_4 , F. must have hit upon more favorable conditions than A. for the prepn. of these 2 substances by this method; A. still believes that, calcg. from the thiocyanate and the N_2H_4 salt, the prepn. of A through the hydrazodicarboxthioamide and its mono-Me ether is the quicker and, above all, by far the more profitable method; to prep. B, a combination of the 2 methods is probably best, the perthiocyanic acid being converted into mono-Me trithioalkophanate and this into B with N_2H_4 , the B being isolated through the N_2H_4 salt. F.'s failure to methylate B was due to his using MeI instead of Me_2SO_4 . The action of N_2H_4 on phenyldithioiuret (C) described in F.'s *Ann.* paper had already been studied by Tschenschner in 1921; his results differ in some respects from F.'s. Thus, F.'s *anilino-*

thiourazole (D) and *anilinoiminourazole* (E) were obtained smoothly and without side or intermediate products by the simple action of N_2H_4 on C, probably because the reaction was carried out in alc. and with somewhat more N_2H_4 than was used by F.; moreover, T.'s E differs widely from F.'s D (4 g. from 8 g. C in an amt. of alc. insufficient for soln. boiled 45 min. with 3 mols. $N_2H_4 \cdot H_2O$, cooled, dild. with 2 vols. H_2O and strongly acidified with HCl), leaflets from alc., m. 275° (F., 268°), strongly acid, easily sol. in NaOH and NH_4OH , gives in excess of NH_4OH with $K_3Fe(CN)_6$ a dark brown ppt. and in just the necessary amt. of NaOH the *disulfide*, yellowish crystals from AcOH, m. 233° (F., 225°), easily sol. in NaOH, less easily in NH_4OH ; *methyl ether*, $PhN:C.NH.N:C(SMe).NH$, from D in NH_4OH and Me_2SO , dull cryst. powder from

alc., m. $187-8^\circ$, easily sol. in NaOH, sol. in dil. HCl, insol. in dil. AcOH, gives in HCl with HNO_3 a difficultly sol. *nitrate*, m. 110° (decompn.); in NaOH the ether gives with $K_3Fe(CN)_6$ an unusually intense dark red color, concd. $(NH_4)_2SO_4$ partially pptg. the dye. The HCl filtrate from D, when concd., filtered from the N_2H_4 , HCl and supersatd. with concd. NH_4OH , gives about 2 g. E, leaves with 1 mol. solvent from H_2O , sinters about 105° , m. 157° , is pronouncedly basic and also distinctly acid (dissolving easily in NaOH), forms in HCl with dil. HNO_3 a very difficultly sol. *nitrate*, decomp. 118° ; E gives in dil. AcOH with excess of concd. $K_3Fe(CN)_6$ and subsequent treatment with NH_4OH the azo compd. *N^o-phenyldehydroguanosole*, $PhN:C.N:N.C(NH).NH$,

light brown-red powder from dil. NaOH + concd. $(NH_4)_2SO_4$, deflagrates 138° , insol. in dil. AcOH, slowly decompd. by mineral acids, easily sol. in dil. NaOH with deep red color. A repetition of the expt. by which F. obtained a substance m. 70° which he calls E yielded an oil from which were isolated D and two basic substances: platelets, m. 149° , possibly F.'s aminoguanylphenylthiourea, and leaves identical with E above.

C. A. R.

Oxidation of α -dinaphthoxanthenes. H. K. SENGUPTA AND S. H. TUCKER. *J. Chem. Soc.* 121, 557-68(1922).—Oxidation of the condensation products of α - $C_{10}H_7OH$ and ketones (7,7-dialkyl- α -dinaphthoxanthenes) gives rise to 2 series of brightly colored compds., orange products (5,6-diketo-7,7-dialkyl-5,6-dihydro- α -dinaphthoxanthenes) containing an *o*-quinonoid grouping and yellow products (di-2- α -naphthoquinonyldialkylmethanes) containing 2 *p*-quinonoid groupings. The oxidation of $Me_2C(C_{10}H_7)_2O$ with $Na_2Cr_2O_7$ in glacial AcOH gives a mixt. of 5,6-diketo-7,7-dimethyl-5,6-dihydro- α -dinaphthoxanthene (A), $C_{22}H_{16}O_3$, dark orange needles, m. 287° (*nitro derivative*, long yellow needles, decomp. 330°), and β,β -di-2- α -naphthoquinonylpropane (B), $C_{22}H_{16}O_4$, brilliant yellow plates, m. $245-8^\circ$, which are not attacked by HNO_3 . A and B are sepd. by the greater insolv. of A in AcOH. Traces of A are removed from B by nitration of A. A and α - $C_6H_4(NH_2)_2$ give a *quinoxaline*, $C_{22}H_{16}ON_2$, pale brown needles, m. $251-2^\circ$; A *diacetate*, needles, m. $251-4^\circ$. The reduction of B with Zn dust and AcOH gives 5,9-dihydroxy-7,7-dimethyl- α -dinaphthoxanthene (C), which crysts. with 1 AcOH, lost at $120-5^\circ$, and m. 254° . C is monoclinic; $a:b:c = 0.872:1:1.365$, β $99^\circ 43'$, $a(100)$, $m(110)$, $c(001)$, $g(011)$. Addition of hot H_2O to a hot alc. soln. ppts. plates with 1 EtOH; it also seps. with PhMe of crystn. *Diacetate*, needles, m. $239-41^\circ$. *Dibenzate*, pointed laminas with 1 AcOH, m. $239-40^\circ$. *Dimethoxy derivative*, pale salmon plates, m. 291° . 5,6-Diketo-7-methyl-7-ethyl-5,6-dihydro- α -dinaphthoxanthene, by the oxidation of $MeEtC(C_{10}H_7)_2O$ as above, orange needles from AcOH or dil. C_6H_6N , m. 276° (decompn.). In sunlight it turns scarlet. *Nitro derivative*, pale salmon prisms, m. 301° . *Diacetate*, needles, m. $242-4^\circ$. *Quinoxaline*, short, bright yellow rods, m. $236-41^\circ$. The C_6H_5N soln. is red with deep green fluorescence. β,β -Di-2- α -naphthoquinonylbutane, yellow laminas, m. $219-20^\circ$. Upon reduction this yields 5,9-dihydroxy-

7-methyl-7-ethyl- α -dinaphthoxanthene, thick hexagonal plates with 1 AcOH, removed on exposure to air, giving a mauve powder, m. 299°. *Diacetate*, warty crystals, m. 221-3°. *Dibenzate*, by heating with BzCl for 1 min. only, short rods, m. 235-7°. *Dimethoxy derivative*, m. 228-30°. 5,6-Diketo-7,7-diethyl-5,6-dihydro- α -dinaphthoxanthene, deep orange, rapidly turning scarlet in the light; *nitro derivative*, salmon-red, m. 282-4°. *Quinoxaline*, yellow rods, m. 218-9°. β , β -Di-2-naphthoquinonylpentane, yellow plates, m. 251°, which yield, on reduction, 5,9-dihydroxy-7,7-diethyl- α -dinaphthoxanthene, pink, monoclinic crystals, losing 1 AcOH at 90°, and m. 295° (decompn.). The crystals with 1 AcOH show $a:b = 0.834$, β 104° 42', $a(100)$, $m(110)$, $c(001)$. 5,6-Diketo-7-methyl-7-propyl-5,6-dihydro- α -dinaphthoxanthene, m. 219-20°; it does not give a NO₂ deriv. β , β -Di-2- α -naphthoquinonylpentane, thick, yellow laminas, m. 203-4°. The complete sepn. of these 2 compds. is difficult. 5,9-Dihydroxy-7-methyl-7-propyl- α -dinaphthoxanthene, orthorhomboids, m. 290° (decompn.), $a:b:c = 0.704:1:0.793$, $b(010)$, $a(100)$, $c(111)$. *Dibenzate*, rods, m. 216-8°. C. J. WEST

Piperitone. II. Benzylidene-dl-piperitone. JOHN READ AND H. G. SMITH. *J. Chem. Soc.* 121, 574-82(1922); cf. *C. A.* 15, 2859.— α -Benzylidene-dl-piperitone (A), pale yellow monoclinic prisms, exhibiting high transparency and luster, gradually lost on exposure to diffuse light, quickly in direct sunlight, m. 59-61°, $a:b:c = 0.9321:1:0.3899$, β 72° 36', $d(\bar{1}11)$, $e(\bar{1}21)$. The β -form, lustrous, rhombic normal crystals, quite stable in diffused light, m. 63-4°, $a:b:c = 0.4841:1:0.9334$, $b(010)$, $l(250)$, $n(470)$, $m(110)$, $p(310)$, $d(013)$. The 2 forms may be obtained at will by seeding a supersatd. alc. soln. at room temp. with the desired form. The α -form is less sol. and the stable one and is always formed when the molten substance solidifies. At present this substance appears to be one of the best defined cases of enantiotropic dimorphism yet recorded in org. chemistry. Dissolved in HBr-AcOH, a red compound, C₁₇H₂₀O.HBr, seps., m. 91-5°, stable in dry air, but dissociated by H₂O, EtOH, AcMe, etc. Similar color changes were observed with concd. H₂SO₄ and Ac₂O. Reduction with Na and EtOH appeared to give a benzyl-*p*-menthenol, b.p. 197-210°, which formed a phenylurethan, lustrous, feathery needles, m. 140-1°. The condensation of *l*-piperitone with BzH gave a dark reddish brown liquid, from which A sepd. upon seeding. This would indicate that complete racemization occurred during the reaction. The condensation with HCl gave only about 20% of the yield of product secured from the alk. condensation. III. The oximes of dl-piperitone. JOHN READ, H. G. SMITH, AND MARIE BENTRIVOGGIO. *Ibid* 582-93.—The formation of the oxime appears to be favored by the presence of acid, the use of dil. alc. as a solvent and the application of heat, except in strongly acid soln. The formation of hydroxylamino-oxime was best effected by prolonged shaking of the ketone at ordinary temp. with aq. NH₂OH containing an excess of alkali. The final method adopted consisted in mixing 50 g. dl-piperitone with 25 g. NH₂OH.HCl (10% excess) in 50 cc. H₂O, then adding bot MeOH to give a homogeneous liquid, depressing the acidity by adding 60 g. AcONa, and heating 5-6 hrs. under a reflux. Crystn. from MeOH gave the pure dl-piperitone α -oxime, triclinic, normal prisms, m. 118-9°, $a:b:c = 0.7145:1:0.5247$, α 68° 11', β 112° 34', γ 81° 20', $b(010)$, $m(110)$, $m'(\bar{1}\bar{1}0)$, $c(001)$, $o(\bar{0}\bar{1}1)$, $d(\bar{1}01)$, $e(\bar{1}11)$. The oxime is markedly volatile in steam and its vapor has an odor very similar to that of menthol. It is insol. in dil. NaOH. The hydrochloride forms on passing dry HCl into the C₆H₆ soln., rhombic, bolohedral crystals, decomp. 157°, stable in air, but rapidly decompd. by H₂O, or dil. Na₂CO₃, always giving the α -oxime. The β -oxime appeared to give an unstable HCl salt, which underwent transformation to the stable α -deriv. *p*-Nitrobenzoyl derivative, soft, opaque needles, m. 126-7°, readily forms with *p*-O₂NC₆H₄COCl; it does not form a stable HCl salt but is hydrolyzed by HCl in C₆H₆. *m*-Nitrobenzoyl derivative, small needles, m. 104-5°. Benzoyl derivative, oil which would not cryst. The β -oxime was

obtained by extg. the alc. mother-liquors of the β -deriv. with dil. H_2SO_4 , removing the unchanged ketone, neutralizing, and recrystg. the product from abs. EtOH, monoclinic holohedral prisms, m. 88–9°, $a:b:c = 0.6670:1:0.6794$, β 93° 02', $a(100)$, $c(001)$, $m(120)$, $d(102)$. Its properties are similar to those of the α -deriv. The action of acid chlorides gives the same products as the α -deriv. Both oximes add Br, giving *dibromodipiperitone oxime*, monoclinic, holohedral prisms, decomp. 124° after 1 crystn. from alc., and between 133–140° in a bath preheated to 130°, $a:b:c 0.6169:1:0.9614$, β 99° 06', $o(011)$, $m(120)$, $c(001)$. Because the β -oxime reacts more readily, this might be considered a deriv. of this form. With dil. NaOH the product gives a vivid emerald-green color, changing to yellow and then forming a brown oil and NaBr. HCl in C_6H_6 appears to form an unstable hydrochloride. C. J. West

Quinoline series. I. Synthesis of 4-substituted quinolines and of quinoline-4-carboxylic acids. ERNST THIERLEPPE. *Ber.* 55B, 127–35(1922).—The following expts. were made in attempts to synthesize 4-substituted quinolines directly or from 2,4-disubstituted derivs. with an easily removal substituent on position 2. $PhNH_2$ and $MeCOCH_2CHO$ gave a *Schiff base* $PhN:CHCH_2COMe$ (A) and $p-MeOC_6H_4NH_2$ and $MeCOCH_2COCO_2Et$ yielded a *product* $p-MeOC_6H_4N:C(CO_2Et)CH_2COMe$ (B), but all attempts to effect a ring closure in these compds. under the most varied conditions and with numerous condensation agents failed. This failure is probably due to the spatial configuration of the intermediate products A and B, the group $-N:C-$ permitting a *cis-trans* isomerism and the compds. obtained apparently being the *trans*-forms. A (67 g. from 91.5 g. of the Na salt of $MeCOCH_2CHO$ in H_2O treated dropwise with 95 g. $PhNH_2 \cdot HCl$ in H_2O and quickly extd. with Et_2O), crystals from $EtOH-H_2O$, m. 91.5° (under 2.5–5.0 mm. most of it dists. 128–34° and the solidified distillate plunged into a bath at 61° m. clear for an instant but at once resolidifies and m. again 83–4°; recrystn. of the 61° form from alc., Et_2O , etc., gives the 91.5° form); A seps. from $CHCl_3$ in stout tables, mol. wt. in freezing $(CH_2Br)_2$ 165–76, in boiling $CHCl_3$ 170–9, gives $CO(NHPh)_2$ with $PhNCO$, $BzNHPh$ with $BzCl$, $AcNHPh$ with $AcOH$, at once decolorizes $KMnO_4$ in soda, gives with $H_2NCONHNH_2 \cdot HCl$ crystals, decomp. about 243°, whose N content lies, depending on the length of boiling in alc., between that corresponding to the semicarbazinosemicarbazone of A and to the disemicarbazone of $MeCOCH_2CHO$. B, yellow crystals from low boiling ligroin, m. 68°, mol. wt. in freezing $(CH_2Br)_2$ 234–44. *α -Ethoxalyl-N-methylacetanilide* (41 g. from 11.5 g. Na dust in Et_2O converted with 23 g. $EtOH$ into $NaOEt$, then treated with 74.5 g. finely powdered $AcNMePh$ and 73 g. $(CO_2Et)_2$), crystals from dil. alc., m. 84.5°; 24.6 g. turbinized with 200 g. concd. H_2SO_4 at -15° and allowed to stand overnight yields 22 g. *ethyl N-methyl-2-quinolone-4-carboxylate*, crystals from dil. alc., m. 134–5°; 14 g. boiled 0.5 hr. with 80 cc. NaOH soln. (3.2 g. NaOH) gives 13 g. of the free acid, while 11.6 g. added in portions to 15.6 g. PCl_5 in 20 g. $POCl_3$ at about 76° and boiled 3 hrs. yields 10.3 g. *ethyl 2-chloroquinolone-4-carboxylate* (C), yellow crystals from 50% alc., m. 64.5°; the free acid, decomp. 198–202°, is obtained in 2.5 g. yield from 2.6 g. of the HO acid with 4 g. PCl_5 and 6 g. $POCl_3$; 1.7 g. of it heated 4 hrs. on the H_2O bath with 9 g. N_2H_4 and allowed to stand overnight gives 1 g. *2-hydrazinocinchoninic acid*, yellow crystals from hot dil. H_2SO_4 , contracts 290°, does not m. 305°. *2-Hydrazinocinchoninic hydrazide* (2.3 g. from 3 g. C boiled 2 hrs. with 15 g. N_2H_4), colorless or faintly reddish crystals from alc., becomes brown 190°, softens 215°, m. 223–9° (gas evolution). *Cinchoninic hydrazide* (0.8 g. from 1 g. of the ester heated 2 hrs. at 110° with 1 g. $N_2H_4 \cdot H_2O$), crystals from C_6H_6 , m. 154.5°, easily sol. in cold mineral acids and NaOH. *2-Iodoquinolone-4-carboxylic acid* (0.8 g. from 1 g. C, 1 g. KI, 0.5 g. amorphous P and 9 cc. HI (d. 1.50) heated 3 hrs. on the H_2O bath and 1.5 hrs. at 150°), crystals from H_2O or alc., turns brown 180°, sinters 190°, m. 195–6°. C. A. R.

Extension and development of the Kishner-Wolff reduction method. I (Preliminary communication). ERNST THIELEPAP. *Ber.* 55B, 136-8(1922); cf. *C. A.*, 14, 3633.—Lepidone hydrazone (A) is obtained in 20 g. yield from 32 g. 2-chlorolepidine boiled 3 hrs. with 146 g. $N_2H_4 \cdot H_2O$. Lepidone (20 g.) heated 10 hrs. at 200° with 90 g. $N_2H_4 \cdot H_2O$ (13 atm.) and, after cooling and releasing the pressure, heated another 4 hrs. at 200° gave 8.4 g. A and 9 g. hydrazolepidine. After repeated crystn. from H_2O A m. 148° , turns brown and evolves a little gas at 220° ; heated in a tube, it evolves gas and smells of NH_3 and later of lepidine (B) and remains liquid on cooling; after long standing in the air A, originally pure, also smells of B, m. considerably lower and shows a loss of about 1% N; 10 g. A heated 72 hrs. at $150-80^\circ$ with 0.5 g. KOH gives 2.5 g. B; from 4.3 g. A in 50 cc. boiling H_2O treated in the course of 1 hr. with 125 cc. of 10% $CuSO_4$, made alk. with NaOH and boiled 1 hr. is obtained 3.7 g. B; with $FeCl_3$, solns. of A evolve gas immediately even in the cold.

C. A. R.

Arylated pyridines. III. Quinodihydropyridines. W. DILTHEY. *Ber.* 55B, 57-9 (1922); cf. *C. A.* 15, 3843.—This preliminary paper is published in view of Schneider's refusal (cf. *C. A.* 16, 1247) to leave the field to D. (S. has since agreed to limit his investigations to the "pyranhydrones" and anhydro bases obtained from alkyppyrylium compds. with alkalies and hydrazines). In attempts to obtain in the pyridine series compds. analogous to the deeply colored anhydro bases formed from *p*-hydroxyarylpyrylium salts with weak alkalies, MeI was added (often with great difficulty) to *p*-hydroxytriphenylpyridines of both the α - and γ -series, but HI could not be split off from these compds. with alkalies; there always resulted deeply colored solns. from which the desired *N*-alkylquinopyridones could not be pptd., acidification with AcOH giving the unchanged methiodide. It has now been found, however, that the desired compds. can be obtained if an aromatic residue is substituted on the N by the action of $PhNH_2$ on the corresponding pyrylium salts. Thus, 2 g. 2,6-diphenyl-4-*p*-hydroxyphenylpyrylium chloride heated with 3.5 g. $PhNH_2$ on the H_2O bath until the deep red color disappears yields 1,2,6-triphenyl-4-*p*-hydroxyphenylpyridinium chloride, faintly yellowish spears from dil. alc. containing a drop of HCl, turns superficially red in a m. p. tube but does not m. 340° , can be recrystd. from *distd.* H_2O ; from faintly alk. tap H_2O it seps. after some days as the anhydro base, 1,2,6-triphenyl-4-quinopyridan, $O: C_6H_5; C_6H_5$. NPh_3 (prepd. from the chloride and NH_3 in alc.), yellow-red needles from $EtOH-H_2O$, $CHCl_3$ or C_6H_5N , m. 302° ; neither it nor its salts show fluorescence in soln.; it becomes colorless on heating but the red color reappears on cooling; the base is slightly sol. in cold H_2O with yellow color, not noticeably in aq. soda or dil. NaOH, even on heating, although the liquids become yellow.

C. A. R.

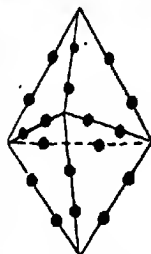
Hyoscyamine and its sulfate. Preparation and racemization. A. GÖRIS AND P. COSRY. *Bull. sci. pharmacol.* 29, 113-21(1922).—At ordinary temps. atropine is 10 times as sol. in C_6H_6 as is hyoscyamine, 100 cc. of the solvent taking up 9.214 g. of the former and 0.920 of the latter at 15° . A sample of hyoscyamine prepd. by crystn. from C_6H_6 had $[\alpha]_D -20.72^\circ$, -21.89° and -23.43° in abs., 50% and 20% alc., resp. In the 1st 2 cases 4% in the last 1% solns. were used. Other tests lead to the conclusion that $[\alpha]_D -22^\circ$ is approx. the correct figure in 50% alc. Anhyd. hyoscyamine sulfate gave $[\alpha]_D -28.03^\circ$. The transformation of hyoscyamine into its isomer atropine takes place slowly in H_2O , alc. or $CHCl_3$ when warmed to 100° ; at higher temps. the change is more rapid and complete.

F. S. HAMMETT

The transformations of cinchonine. E. JUNGLEISCH AND E. LÉGER. *Ann. chim.* 14, 59-128, 129-88(1920).—A résumé of work already published. Cf. *Compt. rend.* 105, 1255; 106, 68, 357, 657, 1410; 112, 942; 113, 651; 114, 1192; 117, 42; 118, 536; 119, 1268; 120, 325; 132, 410, 828; *C. A.* 12, 1548, 1549, 1968; 13, 1217, 1315, 1715, 3159; 14, 178.

G. W. S.

Steric structural formulas of chemical substances in general and of some alkaloids in particular. J. J. LIPST ZWIKKER. *Chem. Weekblad* 19, 158-62(1922).—An extension of the classic conception of stereochem. configuration is proposed, in which complex mols. are represented as C skeletons of regular geometric form. The mol. center of gravity is detd. by the affinity distribution around each atom of the skeleton, with special reference to the asym. carbons. The contact points of the valence tetrahedrons are not considered. Mols. which, according to the generally accepted formulas, have an irregular and compound structure, may be regarded as harmonious groupings of atoms in space to form "constellations" of simple and regular form. The formulas of cinchonine, quinine, berberinal, hydrastine and narceine are used by way of illustration. The rational "constellation" of these mols. is the trigonal bipyramid, on the edges of which 18 carbons are grouped regularly in pairs. The most stable form of this constellation is the hydrocarbon retene.



A. W. DOX

Freezing points of organic substances (TIMMERMANS) 2. Comparison of the union of carbon atoms in graphite and in aromatic hydrocarbons (WIBAUT) 2. Electrolytic preparation of *o*-aminophenol (BROWN, WARNER) 4. Action of acids on ammonium molybdo-malate (DARMOIS) 6. Hydrolysis of cellulose (KAUKO) 23. The mass action relation between the mutarotation constant of dextrose and acid concentration (MURSCHAUSER) 2. Latent polarities of atoms and mechanism of reaction (LAPWORTH) 2. Theoretical derivation of the principle of induced alternate polarities (LAPWORTH) 2. Pyridine (U. S. pat. 1,414,441) 21.

BROOKS, BENJAMIN T.: *The Chemistry of the Non-benzenoid Hydrocarbons*. New York: Chemical Catalog Co. 600 pp.

LANDOLT, HANS: *The Optical Rotating Power of Organic Substances and its Practical Applications*. 2nd Ed. Easton, Pa.: Chemical Publishing Co. 751 pp. \$7.50.

RICHTER, VICTOR VON: *Organic Chemistry or Chemistry of the Carbon Compounds*. Vol. II. *Chemistry of the Carbocyclic Compounds*. Translated from 11th Ger. Ed. Philadelphia: Blakiston's Son & Co. 760 pp.

Alcohols. BADISCHE ANILIN- & SODA-FABRIK. Brit. 175,238, Aug. 15, 1921. Addn. to 158,906. Alcs. are prepd. by passing a mixt. of the vapor of the corresponding aldehyde and H over finely divided Cu obtained by the reduction, preferably at a low temp., of Cu compds. which have not been prepd. by pptn. and whose prepn. has not involved temp. of glowing heat and above. Activators may be added to the catalysts. The following examples are given of the prepn. of catalysts for the production of EtOH from AcH, MeOH from HCHO and *benzyl alc.* from BzH: (1) Pumice is coated with Cu powder and water glass soln. or colloidal silica; the Cu is then oxidized at 200° and finally reduced at 200-250°; (2) Cu formate is brought on to pumice and then treated with H; (3) lumps of malachite are reduced at 200-250°. The catalysts described in the principal patent may also be employed for the production of other alcs. than EtOH. Cf. C. A. 15, 1905.

Dialkyl sulfates. BRITISH CELLULOSE & CHEMICAL MANUFACTURING CO. LTD. and W. BADER. Brit. 175,077, Nov. 12, 1920. Dialkyl sulfates are obtained by distg. alkyl H sulfates, or mixts. contg. them, *in vacuo* so that only the small portion of liquid

actually undergoing distn. is heated and so that the vapors and residue are rapidly removed from the point at which distn. occurs. *E. g.*, the liquid contg. alkyl H sulfate may flow in a thin film over a heated surface, or down a heated coil or tube, or may be sprayed into the still or carried into the heated zone by a revolving drum or moving band. In an example a mixt. of EtOH and fuming H_2SO_4 is caused to flow, by means of revolving orifice down the inside of a vertical heated tube connected to a vacuum and condensing system; Et_2SO_4 seps. from the distillate, the remainder, consisting of alc., H_2SO_4 , etc., being utilized in the next operation. Dimethyl, dipropyl, dibutyl, etc., sulfates may be similarly prepd.

Acetaldehyde from acetylene. SHUICHIRO OCHI, YOICHI ONOZAWA and THE TOKYO INDUSTRIAL LAB. Jap. 38,752, May 30, 1921. AcH is manufd. by passing C_2H_2 into 100 cc. soln. contg. 25 g. H_2SO_4 , 1 g. HgO and 3.6 g. $(AcO)_3Fe$ at 40° during 3 hrs. When 10.3 l. C_2H_2 are absorbed, the product is isolated by steam distn.; the yield is 96%. $(AcO)_3Fe$ prevents the reduction of HgO to Hg. Impure C_2H_2 is used without destroying the catalytic action. The absorbent is used above 10 times. A mixt. of AcOH and Fe_2O_3 , $Fe(OH)_3$, $Fe_2(SO_4)_3$ or other ferric salts may be used instead of $Fe(AcO)_3$.

Reactions between acetylene and hydrobromic acid. W. BAUER. U. S. 1,414,852, May 2. Vinyl bromide in 80% theoretical yield is obtained by slowly introducing C_2H_2 1.5 and HBr 1 part by vol. into a reaction vessel exposed to actinic rays and kept at a temp. near 0° . Ethylene bromide is similarly prepd. by using a mixt. of C_2H_2 1 and HBr 2.1 parts.

Chloropicrin. O. R. SWEENEY. U. S. 1,413,198, Apr. 18. Chloropicrin is made by the interaction of 2 aq. solns., one formed of picric acid and lime or other alk. substance and the other formed of bleaching powder, NaOCl or Cl. Oxidation loss and foaming are suppressed.

Alkylanilines. H. ROGERS. U. S. 1,413,494, Apr. 18. Aniline and an alc., *e. g.*, MeOH, are subjected to the action of an alkylphenylammonium iodide, *e. g.*, methylphenylammonium iodide and MeI, in order to produce dimethylaniline or similar products.

Picric acid from dinitrophenol. L. B. HOLLIDAY and L. G. BADIÉ. U. S. 1,413,914, Apr. 25. Dinitrophenol is treated with HNO_3 and H_2SO_4 at a temp. of about $20-30^\circ$ and the mixt. is then heated to above the m. p. of picric acid and agitated while allowed to cool with deposition of picric acid crystals.

Aminosulfonic acids. BRITISH DYE STUFFS CORPORATION, LTD., AND J. BADDILEY, J. B. PAYMAN and H. WIGNALL. Brit. 175,019, Nov. 3, 1920. *o*-Aminosulfonic acids are obtained by sulfonating primary aromatic amines with chlorosulfonic acid in presence of a solvent, preferably $C_2H_5Cl_4$. The reaction may be completed in the solvent or the chlorosulfonate which sometimes seps. may be collected and heated in the absence of the solvent. In an example, *asym-m*-xylydine-5-sulfonic acid and 2-naphthylamine-1-sulfonic acid are obtained by sulfonating the corresponding amines with chlorosulfonic acid in $C_2H_5Cl_4$ soln. The following primary aromatic amines may also be converted into *o*-aminosulfonic acids in similar manner; aniline, *p*-toluidine, *o*-xylydine, *p*-nitroaniline, *p*-chloroaniline, 3,5-dichloroaniline, 2,4-dichloroaniline, 3,4-dichloroaniline, *o*-chloro-*p*-toluidine, dehydrothiotoluidine, *o*-anisidine, 1,2,5-chloro-*o*-anisidine.

Antraquinone. F. W. ATTACK of British Alizarine Co., Ltd. Brit. 176,235, Feb. 9, 1921. Anthraquinone is prepd. by condensing *o*-benzoylbenzoic acid with H_2SO_4 of 75-80% strength. The process may be made continuous by continuous addn. of molten *o*-benzoylbenzoic acid and by maintaining the strength of the H_2SO_4 either by evapn. such as by blowing in air or by addn. of oleum. The anthraquinone seps. on cooling from the comparatively weak acid and may be withdrawn periodically.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

The role of acids in peptic digestion. WO. OSTWALD AND A. KUHN. *Kolloid-Z.* 30, 234-43 (1922).—Sulfosalicylic acid has the same influence as other acids on the swelling of gelatin and on the "osmotic pressure" of egg albumin soln., that is, as the acid concn. increases, the swelling and "osmotic pressure," resp., increase to a max., then fall off, finally to values less than those for pure water. The higher concns. of acid cause coagulation of the sols. Those concns. of acid which give max. swelling and "osmotic pressure" also favor peptic digestion, in agreement with the theory that the swelling of the substrate plays an important part in peptic digestion. F. L. BROWNE

Hospital chemistry. CHI CHE WANG. *Chem. Bull.* (Chicago) 9, 117-9 (1922). E. J. C.

Biochemical and electrochemical oxidation of organic compounds. A. NATHAN-SOEN. *Z. Elektrochem.* 28, 129-30 (1922).—Comments on Fichter's paper (cf. *C. A.* 16, 569). H. JERMAIN CREIGHTON

Action of yeast-growth stimulant. O. K. WRIGHT. *Biochem. J.* 16, 137-42 (1922).—"The 'bios' of Wilders (*La Cellule*, 13, 313 (1921)) does not enable yeast to assimilate $(\text{NH}_4)_2\text{SO}_4$ simply by its presence or by being consumed at the same time, but the yeast grows solely at the expense of the 'bios' until it reaches a certain degree of concn., and after that it is able to use the $(\text{NH}_4)_2\text{SO}_4$. The 'bios' (vitamin B?, see Williams, *C. A.* 13, 2390) was obtained from lemon juice freed from citric acid (see Harden and Zilva, *C. A.* 13, 1492). BENJAMIN HARROW

Enzymes. VI. Protective action of starch and other substances on ptyalin in acid media. D. MAESTRINI. *Atti accad. Lincei* [v] 30, i, 315-18 (1921); cf. *C. A.* 15, 2644.—M. has made expts. with a number of other substances to ascertain if any of them shares with starch the property of protecting saliva from the destructive action of HCl. Three classes of substances are distinguished: (1) Egg albumin dissolved in physiol. salt soln. and ox-blood fibrin; these exhibit no such property. (2) Sweet almond oil, mutton fat, and egg albumin dissolved in water; these cause the enzymic activity to be far less marked than with 5% starch paste. (3) Animal charcoal exerts a protective action greatly exceeding that of starch. The action is probably due to simple adsorption of the enzyme. J. C. S.

Preparation of thrombozyme in a state of purity. P. NOLF. *Compt. rend. soc. biol.* 84, 890-3 (1921); *Compt. rend. soc. belge biol.* 1921, 60-3.—Tissue exts. contain two substances which influence blood coagulation, namely, *thrombozyme*, which is specific, and a *thromboplastic substance*, which is not. The prepn. of thrombozyme in pure form from horse oxalate plasma is described. It is the substance described by Wooldridge as thrown down from dog's peptone plasma at 0°. The pure substance thus prepd. is only capable of reacting with the thrombogen of mammals, and not with that of birds or fish. J. C. S.

Reduction of osmic acid by fats. J. R. PARTINGTON AND D. B. HUNTINGFORD. *J. Roy. Micr. Soc.* 1921, i, 15-19.—The black substance formed by the reduction of OsO_4 by olein in tissue staining is a hydrated form of OsO_3 , probably $\text{OsO}_2 \cdot 5\text{H}_2\text{O}$. J. C. S.

The nitrogen distribution of proteins extracted by 0.2 per cent sodium hydroxide solution from cottonseed meal, the soy bean, and the coconut. W. G. FRIEDMANN. *J. Biol. Chem.* 51, 17-20 (1922).—The proteins were extd. from the fat-free meal with

0.2% NaOH soln. and were pptd. by acidifying the alk. ext. to 0.1% acidity with dil. AcOH. The following % of the total N was obtained in the ppts.: cottonseed 62.0, soy bean 82.5, coconut 78.3. The N distribution by the Van Slyke method in the protein of the cottonseed, soy bean and coconut meal, resp., was as follows: amide 10.54, 11.31, 7.40; humin 1.88, 1.84, 2.08; cystine 1.11, 1.04, 0.86; arginine 23.48, 14.57, 28.60; histidine 4.94, 5.92, 4.88; lysine 5.10, 8.28, 4.56; amino N of filtrate 51.26, 54.32, 47.18; non-amino N of filtrate 2.15, 2.71, 2.94. The protein pptd. from the NaOH ext. of cottonseed meal had the same N distribution as that of cottonseed globulin. That from the soy bean showed a somewhat similar distribution while that from the coconut differed markedly from coconut globulin in the arginine N value (28.6 as compared with 15.92). The sol. N fraction which remained after pptn. of the protein by acidification still contained proteins.

A. P. LOTHROP

Fat-soluble vitamin. X. Further observations on the occurrence of the fat-soluble vitamin with yellow plant pigments. H. STERNBOCK AND MARIANA T. SEUL. *J. Biol. Chem.* 51, 63-76(1922); cf. *C. A.* 16, 2166.—Data are presented which further emphasize the fact that the fat-sol. vitamin often occurs most prominently where there are found the largest amts. of certain yellow pigments. White sweet potatoes and white carrots were found to contain little fat-sol. vitamin which stands in marked contrast to the observations on the yellow pigmented varieties. The tops of white carrot roots, slightly pigmented with chlorophyll and contg. a small amt. of yellow pigment, were found richer in fat-sol. vitamin than the bottoms contg. only $\frac{1}{4}$ as much pigment. Green cabbage leaves taken from the heart of cabbage plants which failed to 'head' were found much richer in fat-sol. vitamin than white cabbage leaves in the head. The latter contained only $\frac{1}{10}$ as much yellow pigment."

A. P. LOTHROP

The unsaturated fatty acids of liver lecithin. P. A. LÉVENE AND H. S. SMITH. *J. Biol. Chem.* 51, 285-94(1922); cf. *C. A.* 14, 3646; 15, 4018.—Lecithin, obtained from the Me_2CO ext. of the liver, yields only two *unsatd.* acids, oleic and arachidonic ($\text{C}_{19}\text{H}_{37}\text{CO}_2\text{H}$) and the ratio of the two is approx. 1.3 parts of oleic to 1 part of arachidonic acid. From the Et_2O ext. a lecithin of lower unsatn. was obtained containing 4.3 parts of oleic to 1 part of arachidonic acid. It is evident, therefore, that the liver contains several lecithins and that the oleyl lecithin predominates.

A. P. LOTHROP

The effect of acid on the progress of lactic fermentation. E. BACHERACH AND H. CARDOT. *Compt. rend. soc. biol.* 86, 583-6(1922).—Measured in terms of mol. concn. or of p_{H} optimum there is great similarity in the action of various acids, both org. and inorg., in promoting fermentation. The optimum was found to be in most cases at p_{H} 3.7-4.5. Phosphoric acid is an exception to the rule, requiring a much greater mol. concn. and yielding less acidity in 24 hrs.

S. MORGULIS

Physiologic and therapeutic properties of tissue diastases. Existence of synthetic diastases. F. MAIGNON. *Compt. rend.* 174, 566-9(1922).—Expts. *in vitro* to det. the existence of synthetic diastases gave negative results. The action of tissue diastases is specific in the sense that those of the liver act only upon the hepatic function, those of the thyroid only upon the thyroid function, etc. These diastases are without action when administered to healthy subjects with organs functioning normally. L. W. R.

Surface equilibrium of the serum and of some colloidal solutions. P. LÉCOMTE DU NOÛY. *Compt. rend.* 174, 962-3(1922).—Surface tension at a constant temp. was detd. for blood serum and its dilns., for Na oleate, glycocholate and taurocholate, and for saponin, and was found to diminish as a function of the time, rapidly at first then more slowly. The curve of the phenomena resembled closely that of the phenomena of adsorption and may be expressed by the equation $\gamma = \gamma_0 e^{-k_1 t^{1/2}}$ in which γ_0 = initial tension, γ = surface tension and t = time in min. For the serum the drop from initial tension varied from 2 to 5 dynes in 20 min. With serum dild. with isotonic NaCl up to

1 in 1 million the phenomenon was observed but attained a max. in a diln. of about 1 in 10000. At this diln. the drop was 12 to 15 dynes in 2 hrs. With Na oleate under the same conditions, 20 dynes. Cf. *C. A.* 16, 1599. L. W. RIGGS

Hydrogen-ion concentration studies on distilled water, physiologic sodium chloride, glucose and other solutions used for intravenous medication. J. R. WILLIAMS AND MADELINE SWETT. *J. Am. Med. Assoc.* 78, 1024-6(1922).—Twenty expts. are outlined. Partial summary: When fluids that have a higher or lower p_H concn. than that of the blood are injected into the circulation at a rate or in an amt. that the blood cannot neutralize or buffer, reactions characterized by chills and prostration follow. Distd. water, if not carefully prepd. or when stored as a stock soln., becomes highly acid so that when used as a solvent it may produce a soln. with a much higher p_H than that of the body. Glucose solns. become highly acid when boiled or permitted to stand for a few hrs. Stock glucose solns. as used clinically are highly acid. Physiol. NaCl soln., when prepd. with stock distd. water or impure salt, may be highly acid. It should contain not only the amt. of salt which will make it isotonic with the blood, but it should also have the same p_H concn. These solns. may be easily corrected as to p_H concn. by the addn. of buffer salts. Practical application of "buffers" in the regulation of hydrogen-ion concentration of intravenous solutions. RALPH R. MELLON, E. A. SLAGLE AND S. F. ACREE. *Ibid* 1026-9.—A general discussion to show the "scientific reasons for buffering injection fluids." L. W. RIGGS

Research in chemistry as related to medicine. R. H. CHITTENDEN. *J. Am. Med. Assoc.* 78, 1273-8(1922).—Coöperation, by a group of investigators each of whom is a master in his own particular field, is urged. "Medicine is rapidly changing from an art to a science, and in the accomplishment of this much desired transformation with all it implies in the preventing and cure of disease, chemistry is destined to play an important part." L. W. RIGGS

Synthesis of ethyl butyrate in egg secretion. OTTO GLASER. *Science* 55, 486 (1922); cf. *C. A.* 15, 4030.—In the analysis of egg secretion an enzyme of the lipase group was isolated. In the presence of this "lipolysin" droplets of egg fat decrease in diam. while the hydrolysis of other neutral fats and the cleavage of ethyl butyrate are measurably accelerated. To egg secretion, prepd. free from contamination as possible, was added EtOH and C_4H_7COOH . Suitable controls contg. but one of the reagents were made and the p_H was detd. after 40 and 60 min. digestion at 20°. In both instances the controls were more acid than the test contg. both acid and alc. In the latter the odor of ethyl butyrate was present and continued to increase in intensity for 18 hrs., but was absent from both controls. L. W. RIGGS

The sensibility of saccharase to ultra-violet light and oxidizing agents. OLOF SVANBERG. *Arkiv Kemi, Mineral. Geol.* 8, 1-17(1921).—The destructive influence of ultra-violet light on invertase is largely a secondary photochem. effect. Blowing H_2 gas through the enzyme soln. lessens destruction. Impurities in the invertase prepn. as detd. by the dry wt. of the prepn., decrease destruction. H_2O_2 does not destroy, invertase; O_3 does, but the effect of ultra-violet light is only partially explained by the O_3 produced. Amylase (malt) is more sensitive to oxidative influences, and the effect of ultra-violet light can be wholly explained by the amt. of O_3 produced by it. G. E. S.

Steric transformation of hexoses by organs and cells. S. ISAAC AND E. ADLER. *Z. physiol. Chem.* 115, 105-29(1921).—No evidence could be obtained that hashed liver, ox uterus or erythrocytes could convert levulose into dextrose or that in the alc. fermentation of levulose dextrose was first formed. The conclusion is drawn that enzymes which may be responsible for such transformation in the organism do not circulate in the blood in the fashion as sometimes assumed in immunology, but that the changes depend upon intact cell structure. R. L. STEHLÉ

The specific nature of saccharase and raffinase. R. WILLSTÄTTER AND R. KUHN. *Z. physiol. Chem.* 115, 180-98(1921).—In a variety of invertin preps. (free from melibiase) the ratio raffinose:invertin was const. (11.3) and could not be altered by procedures which might have been expected to result in a partial sepn. of the 2 enzymes. Two distillery yeasts gave ratios of 5.1 and 5.4, which also were not appreciably altered by fractionating procedures. R. L. STEHLÉ

Maltase. The difference between maltase and α -glucosidase. Maltase. R. WILLSTÄTTER AND N. STEIBELT. *Z. physiol. Chem.* 115, 199-210(1921).—In a series of brewery yeasts the ratio glucosidase:maltase varied between 7.7 and 0.9. Even in the same prepn. the ratio altered on standing in the cold for several days. It appears, therefore, that maltase and α -glucosidase are different enzymes. R. L. STEHLÉ

Maltase. The fermentative action of maltase-poor yeasts. Maltase. R. WILLSTÄTTER AND W. STEIBELT. *Z. physiol. Chem.* 115, 211-34(1921); cf. *C. A.* 15, 1730.—Brewery and distillery yeasts showed enormous differences in the relative quantities of maltase and invertase. The distillery yeasts which might be expected to be very rich in maltase are extraordinarily poor. Several distillery yeasts which were practically free from maltase fermented maltose at a rate which excludes the possibility of preliminary maltase action. The conclusion appears inevitable that maltose may be fermented directly and not necessarily after a previous hydrolysis. Both direct and indirect fermentation probably occur with most yeasts, even with those richest in maltase. R. L. STEHLÉ

The thermostability of the coenzyme of yeast and its differentiation from vitamin B. T. THOLIN. *Z. physiol. Chem.* 115, 235-56(1921).—At 96° and when $p_H = 5.8$ the activity of the coenzyme of yeast is halved. The difference between the coenzyme of yeast and the fermentation accelerators of yeast and cabbage (vitamins) is indicated by different degrees of resistance to heat. R. L. STEHLÉ

The diastasic action of malt flour and of the other malt preparations (liquid, pasty and dry extracts). RAOUL LECOQ. *J. pharm. chim.* 25, 18-25(1922).—The optimum temp. of diastasic action on starches is 75°. Malt flour has the full diastase content of the malt, with small amts. of maltose, while com. exts. are rich in maltose, but deficient in diastase, which has been partly destroyed in the processes of manuf. S. W.

Effect of penetrating radium rays on inorganic and hiocolloids (FERNAU, PAUL) 3.

B—METHODS AND APPARATUS

STANLEY K. BENKOICY

The application of the indicator method to the examination of stomach and intestinal juice. L. MICHAELIS AND F. MUELLER. *Dent. med. Wochschr.* 48, 252(1922).— α - and γ -Dinitrophenol and *m*- and *p*-nitrophenol permit a p_H detn. within a range of 3-8.5. β -Dinitrophenol permits a range from 2.4-3.2. For greater p_H concns. crystal violet is used. Filtered stomach contents are tested with Congo paper. If the reaction is distinctly acid, crystal violet is used as indicator, a range from 1.1 to 2.3 being afforded. The comparing tubes are prepd. as follows:

Test-tube	1	2	3	4	5	6	7	
0.1 N HCl	6.35	4.0	2.5	1.6	1.0	0.63	0.4	cc. made up to 10 cc. with distd.
p_H	1.1	1.3	1.5	1.7	1.9	2.1	2.3	water.

Another tube is filled with 10 cc. filtered stomach juice. Then 0.5 cc. (0.03:150.0) aq. soln. of crystal violet is added to each tube within 1-2 min. and the tube contg. the stomach juice is compared with the standard set. It is permissible to work with half the quantities, but in that range the stomach juice cannot be dild. Quick information can be obtained by adding to a sample of stomach juice, in the series given, the phenols and

note with which of these the first yellow appears (*m*-nitrophenol (p_H 8.4-7), *p*-nitrophenol (7-5.4), dinitrophenol (5.4-4.2), α -dinitrophenol (4.3-3), β -dinitrophenol (3.4-2.4)). Then more accurate detns. can be made by means of a technic similar to the one previously described for urine. A correction is necessary. From the p_H found 0.2 is to be subtracted for α -, 0.1 for γ -dinitrophenol and 0.2 for *p*-dinitrophenol. The standard of β -dinitrophenol is made with an aq. stock soln. of 0.1:300. This is dild. 10 times with approx. 0.1 *N* Na_2CO_3 soln. With this dild. 5 tubes are prepd. as follows:

Soln.	1*	2	3	4	5
	0.49	0.76	1.15	1.68	2.44 cc.
0.1 <i>N</i> Na_2CO_3	6.51	6.24	5.85	5.32	4.56 cc.
p_H	2.4	2.6	2.8	3.0	3.2

S. AMBERG

Determination of urea in blood. G. PÉGURIER. *Répert. pharm.* 34, 65-71 (1922).—An illustrated description of a urcometer in which water is used in place of mercury. It is called a "hemo-ureometer" and is so graduated that the required amounts of alk. hypobromite soln., sugar soln., and blood serum can be superimposed upon one another and the N liberated read off directly in cgs.

A. G. DU MÊZ

The use of levulose as a test for hepatic inefficiency. J. C. SPENCE AND P. C. BRITT. *Lancet* 1921, II, 1362-6.—In a healthy adult with a normal liver function, 50 g. of levulose will produce no rise in blood sugar. With diminished liver function a definite rise in blood sugar will result from the ingestion of levulose. The height and length of the "blood sugar curve" which portrays this rise will be in proportion to the degree of liver insufficiency present. The test is valuable in cases of toxic salvarsan hepatitis and other diseases of the liver. The kidney threshold for levulose is lower than that for glucose and varies in different individuals. The inconstancy of the threshold for levulose renders the older method of testing liver efficiency by urinary examn. inaccurate.

E. B. FINK

The detection of aldehyde in urine. W. SIEFF. *Biochem. Z.* 127, 13-17 (1922).—Twenty to 40 cc. of urine dild. several times with H_2O are acidulated with AcOH (2 cc. 50% acid per 100 cc. soln.) and the aldehyde is distd. into ice-cold H_2O . If Tollen's test with ammoniacal Ag soln. is positive, the presence of an easily volatile aldehyde is quite certain. Acetaldehyde in 1:100,000 is positive by this test. Other substances, such as aromatic amines, alkaloids, polyphenols, α -diketones and cyclohexenones also give positive tests. The reduction of Fehling soln. is significant because hardly any other volatile substance gives the reaction. The red coloration with fuchsin-sulfonate is not very sensitive and is not given by acetone. Rimini's reaction with Lewin's modification (*Ber.* 32, 3388 (1899)) with piperidine instead of diethylamine is not effective with acetone, formaldehyde, trichloroacetaldehyde, isobutyraldehyde, benzaldehyde, salicylaldehyde, phenylacetaldehyde, enanthol and furfural. Paraldehyde and propionaldehyde give positive tests. Fresh Na nitroprusside soln. must be used. S. believes that dimethylhydrosorcinol is the best reagent for detg. the presence of acetaldehyde in body fluids in the presence of acetone. Cf. Neuberg and Reinforth (*C. A.* 14, 3257) and Stepp and Feulgen (*C. A.* 16, 1259).

F. S. HAMMETT

The determination of small amounts of sugar according to Bertrand's method. I. GREINER. *Biochem. Z.* 128, 274-8 (1922).—G. uses the CuSO_4 alkali tartrate and $\text{Fe}_2(\text{SO}_4)_3$ soln. of Bertrand (*Bull. soc. chim.* 35, 1285 (1906)) and a soln. made of 150 g. Na_2CO_3 , 30 g. NaHCO_3 , H_2O to 1 l. and a 0.02 *N* KMnO_4 soln. Ten cc. of the soln. to be tested is added to 10 cc. of the CuSO_4 and carbonate solns. and 10 cc. of the alk. tartrate is added, making a total of 40 cc. The original processes of heating, filtration and washing of the ppt. are followed, except that the soln. is allowed to cool for 15 min. after the

3-min. boiling. In the titration of the ppt. burets with 0.1, 0.02 and 0.01 graduations are used according to the amt. of ppt. expected. A table is given of the Cu equivs. of sugar from 1 to 10 mg. F. S. HAMMERT

The determination of the urea decomposed by urease from the carbon dioxide component of the by-product. Z. ASZODI. *Biochem. Z.* 128, 391-5(1922).—A modification of Partos' (C. A. 14, 2649) method. F. S. HAMMERT

The determination of the hydron concentration of urine with indicators. A. SILBERSTEIN. *Biochem. Z.* 128, 534-9(1922).—S. shakes urine with animal charcoal, filters, and detcs. the p_H with indicators. F. S. HAMMERT

Estimation of total sulfur in urine. ROBERT ROBISON. *Biochem. J.* 16, 134-6(1922).—2.5 cc. of the oxidizing reagent (copper nitrate (cryst.) 40 g.; copper chloride (cryst.) 15 g.; water to 100 cc.) are added to 10 cc. of the urine in a 4-inch porcelain basin and evapd. to dryness on a water-bath or elec. hot plate. The residue is heated over a broad spirit flame for 20 min. It is next dissolved in 10 cc. of 2 N HCl and dild. with 300 cc. distd. water. The sulfate is pptd. in the boiling soln. with 10 cc. of a 5% soln. of BaCl₂, dropped in slowly. The ppt. is allowed to stand overnight before being filtered. BENJAMIN HARROW

A buffered physiologic salt solution. ALICE C. EVANS. *J. Infectious Diseases* 30, 95-8(1922).—An isotonic buffered soln. is made by adding 1 part of a mixt. of phosphates to 9 parts of 0.9% NaCl soln. The phosphate mixt. is composed of 8 parts of a soln. of Na₂HPO₄, 2 H₂O, 11.876 g. to the l. and 2 parts of a soln. of KH₂PO₄, 9.078 g. to a l. The buffered salt soln. prepd. with the above proportions had a p_H of 7.4. Other p_H values can be obtained by altering the proportions of the secondary and primary phosphate solids. JULIAN H. LEWIS

An adaptation of the Folin and Wu blood sugar method, applicable to small amounts of blood. A comparison of the blood sugar content of venous and capillary blood. F. J. BAUMANN AND R. L. ISAACSON. *J. Lab. Clin. Med.* 7, 357-60(1922).—The regular Folin-Wu procedure is employed, starting with 0.4 cc. of blood, and centrifuging instead of filtering after addition of the proper quantities of water, tungstate, and H₂SO₄. E. R. LONG

A micro-modification of the method of Benedict for the quantitative determination of reducing sugar in urine. MILLARN SMITH. *J. Lab. Clin. Med.* 7, 364-8(1922).—Correct results for small quantities of sugar in urine can be obtained if the procedure of taking proportionate parts is strictly adhered to. One cc. of Benedict's soln. can be used without the addn. of water but with a proportionate reduction of carbonate. In order to keep the vol. const. during the heating a special test-tube is used instead of an evapg. dish. Accurately pipet 1.0 cc. of Benedict's soln. into the test-tube. Add 0.2-0.7 g. anhyd. Na₂CO₃. Add a pebble or piece of quartz. Heat to boiling and add urine from a Mohr pipet until reduction is complete. If the soln. is kept just at the boiling point by manipulation of the flame and the urine added slowly the best results are obtained. The tendency in the titration of sugar is to go past the end-point because the reduction does not take place as rapidly as the ordinary titrations. With the use of the Mohr pipets described no calcn. is necessary, as the gradations read directly the % of sugar in the urine. If, however, a Folin 5.0 cc. micro-buret is used the calcn. is: 0.02 cc. urine equals % sugar in the urine. The titration of urines contg. less than 0.17% sugar is very unsatisfactory by either the original method or this modification. E. R. LONG

A spirometer for continuously and automatically measuring expired air and sampling for analysis. CHAS. C. GUTHRIE. *J. Lab. Clin. Med.* 7, 421-6(1922).—The app. consists of 2 bell spirometers mounted together and connected so that the expired air can be switched from one to the other without interfering with the respiration of the sub-

ject. While one is filling the other is sampled and emptied. The original must be consulted for the mech. details. Cf. *C. A.* 16, 265, 1102. E. R. LONG

Devices to eliminate certain objectionable factors in the analysis of gastric content. J. L. BUTSCH AND CLAIR M. O'BRIEN. *J. Lab. Clin. Med.* 7, 431-2(1922).—An ordinary salt-mouthed bottle is fitted with a 2-hole stopper from which pass 2 glass tubes bent at right angles. To one is attached a rubber tube connected with an ordinary aspirator; the other is connected with a sterile Reflux tube introduced in the stomach in the usual way. The water tap is turned on and the stomach contents readily flow into the collecting bottle. E. R. LONG

Separate analysis of the corpuscles and the plasma. HSIEN WU. *J. Biol. Chem.* 51, 21-31(1922).—A protein-free filtrate of the corpuscles and plasma can be prepd. which is suitable for all detns. included in the system of blood analysis of Polin and Wu (*C. A.* 13, 2541; 14, 2353). Centrifuge the oxalated blood in graduated tubes until the vol. of corpuscles remains const., the length of time required having been previously detd. Note the vol. of whole blood and of the corpuscles. Carefully pipet off the plasma without disturbing the corpuscle layer. Dil. a convenient vol. of the plasma with 8 vols. of H_2O and then add $1/2$ vol. each of 10% Na_2WO_4 and $1/2$ NH_4SO_4 . Stopper the flask and shake. Remove the plasma above the corpuscle layer as completely as possible. Insert a blood pipet into the corpuscle layer and take out a convenient vol. Take it with 5 vols. of H_2O , rinse the pipet with the corpuscle soln., then add 2 vols. each of Na_2WO_4 soln. and H_2SO_4 . Stopper the flask and shake. The pptd. corpuscles and plasma may be filtered at once. If the pptn. happens to be incomplete and the filtrate is turbid, the analysis may be saved by adding a few drops of NH_4SO_4 to the ppt. mixt. The filtrates are used in the various detns. The following av. results were obtained from the analysis of the corpuscles and plasma, resp., of 20 samples of normal human blood (expressed in mg. per 100 cc.): total non-protein-N 48.3, 28.8; urea-N 17.1, 19.3; uric acid 1.93, 3.92; total creatinine 8.32, 1.47; preformed creatinine 2.48, 1.24; amino-acid N 9.47, 5.52; sugar 99.9, 103.2; NaCl 309.7, 615.2. The % of corpuscles varied from 33 to 57 with an av. of 47.8. The undetd. N is practically all contained in the corpuscles and the suggestion is made that it may quite probably be regarded as peptones and peptides. As sugar and urea are approx. equally distributed their detn. in whole blood is justifiable but for all other constituents plasma analysis should be substituted for whole blood analysis as the actual passage of material into or out of the circulation is effected only through the plasma. A. P. LOTHROP

A new colorimetric method for the determination of plasma proteins. HSIEN WU. *J. Biol. Chem.* 51, 33-9(1922).—In the detn. of the plasma proteins the fibrin is whipped out after recalcification of the oxalated plasma and the globulin is sepd. from the albumin by half satn. with $(NH_4)_2SO_4$. The amts. of fibrin and of albumin are detd. directly while the globulin is detd. by the difference between the total serum proteins (after removal of the fibrin) and the albumin. Proteins in soln., due largely to the tyrosin which they contain, develop a color with phospho-18-molybdictungstic acid (phenol reagent) and the chromogenic value is const. for any given protein under definite conditions of producing the color. This color reaction is employed in detg. the plasma protein. A soln. of tyrosine is used as a standard and the tyrosine equivs. of the plasma proteins of human blood under the conditions described are 16.4 mg. of fibrin, 25.2 mg. of globulin and 27.5 mg. of albumin per 1 mg. of tyrosine. The equivs. of the plasma proteins of different species of animals are probably different and should be detd. when required. All the detns. can be made simultaneously and finished in 1 hr. The deviation from normal values is often marked in pathological cases so that the detn. of plasma proteins is of clinical value. A. P. LOTHROP

Studies on experimental rickets. XVI. A delicate biological test for calcium-depos-

iting substances. E. V. MCCOLLUM, NINA SIMMONDS, P. G. SHIPLEY AND E. A. PARK. *J. Biol. Chem.* 51, 41-9 (1922); cf. *C. A.* 16, 2168.—Young rats which have grown rapidly to about 55-60 g. (35-40 days old) are confined to the following diet for a period of about 35-40 days: whole wheat kernel, 33; whole maize kernel, 33; gelatin, 15; wheat gluten, 15; NaCl, 1; and CaCO₃, 3%. This diet uniformly causes the bones of the animals to be free from Ca as regards the epiphyseal cartilages and the metaphyses and to show an exaggerated type of florid rickets. Some of the rats are then given the substance to be investigated and the rest serve as controls and continue to receive the original basal diet. The test animals and the controls are killed and autopsied at the end of a designated time; the distal end of the left femur and the proximal end of the left tibia are examd. for reformation of the provisional zone of calcification. The tibia is perhaps the better, since the epiphyseal line is straighter and the metaphysis wider. The reappearance of the provisional zone of calcification after the addition of any substance to the rickets-producing diet constitutes a test for the Ca-depositing power of the substance (the so-called "line test"). 2% of cod liver oil, by wt., of the diet brings about this result in 5 days. 0.4% causes no change and 1% does not cause as complete a Ca salt deposition as does 2%. Both test and control animals must be kept under the same conditions of illumination, and since starvation causes redistribution of Ca in the bones, records of the food consumption must be kept during the expt. The basal diet must be so modified when any natural foods are tested that the addition of the food to be examd. will not change the inorg. content of the mixt. used in making the test from that of the original diet used during the preparatory period. This test may be used to det. the ability of any agency to heal rickets and constitutes a valuable aid to further exptl. work in the field of bone pathology.

A. P. LOTHROP

A method for the estimation of total base in urine. C. H. FISKE. *J. Biol. Chem.* 51, 55-61 (1922).—As the total base equiv. of all the 4 bases, Na, K, Ca and Mg, rather than the amt. of each one, is the information which is often required, a method has been devised which is sufficiently precise to furnish figures for the sum of the bases that have the requisite degree of accuracy after the equiv. of the chloride content of the urine has been subtracted. "The urine, after being ashed with H₂SO₄ and HNO₃, is treated with FeCl₃ to remove the phosphate, and with NH₄ acetate to remove the excess Fe. The filtrate from these operations contains the bases, which are finally obtained as sulfates, free from interfering substances, by ignition with H₂SO₄ and then with (NH₄)₂CO₃. The final residue is analyzed for sulfate by the benzidine method and the total quantity of 0.1 N base present calcd. from the results of this analysis." A. P. L.

The hypobromite reaction on urea. PAUL MENAUL. *J. Biol. Chem.* 51, 87-8 (1922).—The hypobromite method of Stehle (*C. A.* 15, 2648) gives lower results than those obtained with the urease method. A number of detns. have been made according to Stehle's procedure using pure urea oxalate and 0.5, 6, and 10% Br solns. From 93.98 to 97.14% of the theoretical amt. of N₂ was obtained, indicating that there is not a quant. liberation of N₂ when urea is acted upon by hypobromite. The gasometric determination of urea. RAYMOND L. STEHLE. *Ibid.* 89-92.—When conducted *in vacuo* the hypobromite reaction with urea does not follow the same course as when conducted at at. pressure and gives quant. results if the vapor tension for the hypobromite soln. left in the app. at the end of the detn. is taken into account, although the error introduced if the vapor tension is assumed to be the same as H₂O is not large enough to invalidate the method for most purposes. If the hypobromite soln. is prepd. by dissolving 100 g. of NaOH in 250 cc. of H₂O and adding 10 cc. of Br for each 100 cc., the vapor tension table given by Dehn, *J. Am. Chem. Soc.* 29, 1317, may be used. In making the detn. the following amts. should be used: 1 cc. of the soln. to be analyzed, 1 cc. of rinse H₂O, and 2 cc. of the NaOBr soln.

A. P. LOTHROP

Clinical method for the estimation of chlorides in blood. HERMAN FRIEND. *J. Biol. Chem.* 51, 115-9(1922).—Obtain the blood on a fasting stomach and sep. the plasma immediately by centrifuging. Pipet 1 cc. of the clear plasma into a 25 cc. volumetric flask containing 10 cc. of H_2O . Add 3 cc. of Al cream and make up to vol. Shake well and allow to stand for 10 min. Filter through a 5 cm. dry filter paper. Pipet 20 cc. of the water-clear filtrate into a 50 cc. beaker or Erlenmeyer flask and add 5 drops of 5% K_2CrO_4 soln. Titrate until the yellow color is changed to a first tint of dirty brown. For very exact work deduct 0.05 cc. from the reading for the reason that the end-point is actually Ag_2CrO_4 . For clinical work this is not necessary. Calcn.: Cc. $AgNO_3$ used $\times 1.17 \times \frac{1}{4} \times 100 =$ mg. NaCl per 100 cc. of plasma. The chlorides in milk may be detd. in exactly the same fashion. The results are from 3-5 mg. of NaCl per 100 cc. of plasma lower than those obtained with the standard McLean and Van Slyke method.

A. P. LOTHROP

A colorimetric method for the determination of sugars in normal human urine. OTTO FOLIN AND HILDING BERGLUND. *J. Biol. Chem.* 51, 209-11(1922).—To 5 cc. of urine add 5 cc. of 0.1 $N H_2SO_4$ and 10 cc. of H_2O . Add 1.5 g. of Lloyd's alkaloidal reagent and shake gently for 2 min. (not longer). Filter and det. the amt. of sugar in 2 cc. of the filtrate as in the Folin and Wu method for blood (C. A. 14, 2353). If the urine is dil., use 10 or 15 cc. and reduce the amt. of H_2O added. For the detn. of total sugar add 1 cc. of 10% HCl to 10 cc. of the filtrate contained in a test-tube graduated at 20 cc. Heat in boiling H_2O for 75 min. Cool thoroughly and add $N NaOH$ (neutralize) until the cloud produced from the material dissolved out of Lloyd's reagent does not disappear on shaking. Dil. the neutralized hydrolyzate to the 20 cc. mark. Add a small pinch of Lloyd's reagent and invert half a dozen times to remove most of the pigment formed during the hydrolysis. Use 2 cc. of the filtrate for the sugar detn. Dil. as well as concd. sugar standards keep indefinitely if made up in a 0.3% soln. of $BzOH$; the deterioration of the dil. soln. is probably due to alkali given off from the containers rather than to destruction by microorganisms.

A. P. LOTHROP

The determination of ammonia by Schloesing's method. R. MOOG. *Compt. rend. soc. biol.* 86, 709-11(1922).—The original method is modified in the sense that the detn. is carried out in a partial vacuum. In one dish are placed 2 cc. $N H_2SO_4$ and in the other the soln. contg. the NH_3 . By means of a tube 6 cc. of 10% lime water is admitted into the latter and the bell jar is evacuated to the extent of 2 cm. pressure. After a lapse of 12 hrs. the acid is titrated against 0.05 $N NaOH$. If milk of magnesia is used the period should be about 20 hrs. Under these conditions a soln. contg. per l. 1 g. uric acid and 20 g. urea does not yield more than a few tenths of a mg. of NH_3 . Known amts. of NH_3 have been recovered quantitatively.

S. MORGULIS

Residual nitrogen values found in blood. ROBERT WODON. *Compt. rend. soc. biol.* 86, 740-2(1922).—Comparing the non-protein nitrogenous components of the blood W. finds that the pptn. with tungstic or CCl_3CO_2H gives comparable results so far as total N, urea, total creatinine, uric acid and amino N are concerned. When the blood is deproteinized with metaphosphoric acid much greater amts. of total N and also somewhat larger values of uric acid are obtained. The excess is believed to be due to the presence in the filtrate of a phosphatide because extg. the filtrate with ether removes this excessive amt. of nitrogenous material and values approximating those by the other 2 methods are obtained. The extn. with ether has no effect on the compn. of the filtrates from bloods treated with tungstic or CCl_3CO_2H .

S. MORGULIS

The determination of the alkaloid content of lupines. F. MACH AND P. LEDERLE. *Landw. Vers. Sta.* 98, 117-124(1921).—Shake well 15 g. of lupine meal in a ground-glass-stoppered bottle with 100 cc. of ether, 50 cc. of $CHCl_3$ and 10 cc. of a 15% soln. of NaOH

and with frequent shakings allow to stand till the next day. If the upper layer is not completely clear add a few drops of water and shake, whereupon it quickly clears. Filter the ethereal soln. through a covered folded filter and add 50 cc. of the filtrate to a cylindrical separatory funnel of 150 cc. capacity, add 50 cc. of ether, shake 3 times, each time with 20 cc. of 1% HCl and draw off, each time, the acid soln. as completely as possible. Free the exts. collected in a beaker from ether and CHCl_3 by warming and after cooling ppt. with 10 cc. of a 10% soln. of silicotungstic acid. Stir the ppt. for $\frac{1}{2}$ hour and after settling filter through an asbestos gooch, wash with a very little 1% HCl, dry at 120° to const. wt., ignite upon a Teclu burner, by placing the gooch in a Pt dish and weigh. The amt. of alkaloid was found by using the factors 0.1744 and 0.2475 times the wt. of the ignited ppt.

F. M. SCHERTZ

Lead studies. I. The estimation of minute amounts of lead in biological material. L. T. FAIRHALL. *J. Ind. Hyg.* 4, 9-20(1922).—The ash is dissolved in dil. HCl, the soln. neutralized with NaOH (methyl orange) and then slightly acidified with HCl. Pb is pptd. as PbS , the washed ppt. dissolved in 2-5 cc. of conc. HNO_3 and boiled to expel H_2S . After neutralizing with NaOH and slightly acidifying with AcOH , an excess of K_2CrO_4 is added and the soln. boiled. The ppt. is dissolved in HCl, and an excess of KI is added to the soln. which is titrated with 0.005 *N* $\text{Na}_2\text{S}_2\text{O}_3$. In biol. materials the method usually gives within 3% of the expected value. G. E. S.

Xylenol blue and its proposed use as an indicator (COHEN) 7.

Ferment filter of bamboo. M. KIUTSI. U. S. 1,412,818, Apr. 11.

C—BACTERIOLOGY

A. K. BALLS

Notes on the Gram stain with description of a new method. VICTOR BURKE. *J. Bact.* 7, 159-82(1922).—Steaming the I soln. on the slide or increasing the period of exposure does not cause the Gram-negative organism to resist decolorization. Drying the film after exposure to the I soln. greatly delays decolorization. The addn. of water to the decolorizer in the bottle or on the slide retards decolorization of Gram-negative organisms and increases the rate of decolorization of Gram-positive ones. Acetone is superior to abs. alc. as a decolorizer. Mounting the films in distd. water, tap water, or physiol. salt soln. does not affect the staining reaction. The addn. of NaHCO_3 to the mounting fluid results in a greater concn. of dye in the Gram-positive organisms, after decolorization, while lactic acid has the opposite effect. The failure of Gram-positive organisms from old cultures or from the genito-urinary tract may be due to the presence of acid.

JOHN T. MYERS

Disinfection studies. The effects of temperature and hydrogen-ion concentration upon the viability of *B. coli* and *B. typhosus* in water. BARNETT COHEN. *J. Bact.* 7, 183-230(1922).—The mortality at const. temp. of bacteria in unbuffered media such as distd. water is variable and coincident with apparently insignificant p_H variations. The use of *M*/500 buffer solns. stabilizes this variability. Subjecting the organisms of the colon-typhoid group to mild lethal conditions under moderate temps. and H-ion concns. tends to magnify the induction period prior to mortality at the max. or logarithmic rate. The period of induction is decreased by higher acidity or temp. At const. p_H , the relative resistance of *B. coli* to *B. typhosus* decreases with rise of temp. from 0:10:20:30 in the ratio of 67:51:18:8. At 20° *B. typhosus* has the greatest tolerance between p_H 5.0 and 6.4. A slight increase in acidity beyond this zone results in conditions of max. mortality. For *B. coli* the zone is wider and centers about p_H 7. The course of disinfection can be expressed by mathematical relations comparable to those of monomol. chem. reactions.

JOHN T. MYERS

Studies on the biology of lactic bacteria: a summary of personal investigations. CONSTANTINO GORINI. *J. Bact.* 7, 271-6(1922).

JOHN T. MYERS

A method for the cultivation of anaerobes. L. D. BUSHNELL. *J. Bact.* 7, 277-81 (1922).—P is used for removal of O in anaerobic jars. Glass fruit jars of the self-seal type or Al pressure cookers are used. The P is ignited with a hot inoculating needle. The O is removed quickly and enough P remains to take care of small leaks. J. T. M.

Substitution of bromothymol blue for litmus in routine laboratory work. H. R. BAKER. *J. Bact.* 7, 301-5(1922).—Bromothymol blue includes the neutral point in its range; hence media can be adjusted to exact neutrality. It will not inhibit acid production. The reaction can be recorded at any time during incubation. The color changes are more marked than with litmus. Heat does not reduce it. The reaction in carbohydrate broth can be read by artificial light.

JOHN T. MYERS

Collodion sacs for aerobic and anaerobic bacterial cultivation. P. L. GATHS. *J. Exptl. Med.* 35, 635-46(1922); cf. *C. A.* 15, 3650.—A simple and convenient method is described for the prepn. and use of collodion sacs for aerobic and anaerobic bacterial cultivation *in vitro*. The sacs are suitable for the study of various problems in bacterial growth and metabolism. By their use with the Smith-Noguchi tissue medium, certain microorganisms may be grown in the absence of the confusing, antigenic protein ppt. characteristic of cultures containing fresh tissue, and thus the organisms are obtained in a suitable condition for serological study.

C. J. WEST

Vaseline tube and syringe method of micro gas analysis of bacterial cultures. J. H. BROWN. *J. Exptl. Med.* 35, 667-84(1922).—In the study of anaerobic bacteria, tubes containing media covered by vaseline being used, it was found that as gas formed the vaseline was forced up the tube; this was used as a measure of the amount of gas formed. Methods are given for the detn. of CO_2 in the gas, for carbonates and CO_2 in the medium and results of the new method compared with those obtained by the use of the Smith fermentation tube and the tube of Eldredge and Rogers.

C. J. WEST

Pneumococcus. I. Acid death point of the pneumococcus. F. T. LORD AND ROBERT N. NYR. *J. Exptl. Med.* 35, 685-7(1922); cf. *C. A.* 13, 3209.—Confirmation of early work. II. Dissolution of pneumococci at varying hydrogen-ion concentrations. Effect of temperature, previous killing of the organisms and fresh human serum on the phenomenon. Behavior of other organisms. *Ibid* 689-98.—Dissoln. in approx. isotonic standard solns. and in approx. isotonic bouillon is most marked at the crit. range of about p_H 5.0 to 7.0. No dissoln. occurs at the most acid end of the scale. It is less marked at ice box temp., but occurs at incubator, room and ice box temp. Pneumococci allowed to grow and die out in glucose bouillon show dissoln. which is progressive from the acid toward the alk. end of the scale. Those killed by heat at 100° for 5 min. do not undergo dissoln. The addn. of fresh human serum at varying p_H prevents dissoln. This dissoln. may be ascribed to an enzyme derived from the bacteria themselves. Other organisms examd. do not undergo dissoln. under similar conditions. III. Dissolution of pneumococci in pneumonic cellular material at varying hydrogen-ion concentrations. Resistance of certain other organisms to dissolution. *Ibid* 699-701.—Pneumococci of types I, II, and III undergo dissoln. when mixed with cellular material from the pneumonic lung at a p_H of 6.95 and 5.5 but not at a p_H of 4.5. IV. Effect of bile at varying hydrogen-ion concentrations on dissolution of pneumococci. *Ibid* 703-5.—Dissoln. takes place most rapidly in bile at a slightly alk. reaction. This is probably due to the death of the organisms and activation of the endocellular enzyme at its optimum H-ion concn.

C. J. WEST

Destroying microorganisms. D. CROWTHER. U. S. 1,413,006, Apr. 18. Material such as foods or vaccines is subjected to the action of a compressed gas such as CO_2 .

until organisms present are satd. and the pressure is then suddenly released while applying sufficient heat to the material to avoid much reduction in temp. due to the expansion of the gas.

D—BOTANY

B. M. DUGGAR

Variation in the manganese content of leaves with age. GABRIEL BERTRAND AND MME. M. ROSENBLATT. *Compt. rend.* 174, 491-3; *Bull. soc. chim.* 31, 345-52 (1922).—In 15 out of 17 species the ash of young leaves contained more Mn than the ash from old leaves.

L. W. RIGGS

Continuous renewal of nutrient solution for plants in water cultures. SAM F. TRELBASE AND B. E. LIVINGSTON. *Science* 55, 483-6(1922).—An app. for providing a continuous flow of a nutrient soln. to plants is described. It consists of a large upper reservoir, a const.-level tank, a lower reservoir, and the culture vessel. The upper reservoir holds 5 gals. of soln. when full and acts like a const.-pressure aspirator. The soln. is made to flow at a practically const. rate from the const.-level tank and drips regularly into the culture vessel which is provided with a waste tube. As thus far used 40 plants have been grown in each culture soln. and 16 l. of soln. or 400 cc. per plant per day were added from a series of 5 outfits delivering 5 different solns. to their respective culture vessels. A diagram of the app. is given.

F. C. COOK

The carbohydrate content of the seed of *Asparagus officinalis* L. W. E. CAKE AND H. H. BARTLETT. *J. Biol. Chem.* 51, 93-102(1922).—"A quant. examn. of asparagus seed has shown that the reserve carbohydrate is in the form of hemicelluloses, which give, on hydrolysis, mannose, glucose, fructose, and galactose. The galactose is in such small quantity that it appears likely that it forms part of a different hemicellulose from that which constitutes the bulk of the reserve carbohydrate. The mannose is in a ratio of 1:1 to the total remaining hexoses. The absence in appreciable quantity of carbohydrates having the properties of cellulose, starch, and inulin makes it seem likely that the hemicelluloses are either glucomannans occurring with fructomannans or else glucofructomannans. The proof that fructose is one of the cleavage products derived from the hemicellulose of asparagus seed confirms the single previous report of fructose among the hydrolytic products of a hemicellulose, namely, in the case of *Phylephas*."

A. P. LOTHROP

Carbon nutrition in cultivated plants. BORNEMANN. *Ang. Bot.* 2, 284-90(1920); cf. C. A. 15, 2110; 16, 949.—All the necessary C for plants is provided by soil CO₂ and when all other growth factors are at optimum, increased growth can only be obtained by an increase in the amt. of CO₂ originating from the soil. With decrease of CO₂ in the air surrounding the plants, the small amts. of carbohydrate formed are required for the elaboration of the N obtained by the roots and a purely vegetative type of growth results. Young plants, when the partial pressure of CO₂ is increased, show at first an increase in vegetative growth; the older cells, however, soon become lignified, and premature development of flowering processes, where possible, occurs. If the plant has storage organs, storage begins prematurely with inhibition of vegetative growth. With the CO₂ partial pressure at a max. vegetative growth is suspended and all assimilated material stored directly. With further increase of the CO₂ content asphyxia occurs.

J. C. S.

Influence of temperature on the formation of starch in vegetable cells. A. MATOGE. *Compt. rend. soc. biol.* 86, 685-6(1922).—In embryos cultivated at 41° the process of development of the starch grain is the same as in those reared under a lower temp. but much slower. The number and size of the grains are smaller, and the resulting coloration with I soln. is much feeble than in lots cultivated at 30°. M. thinks that the higher

temp. interferes with the process of starch formation by diminishing the capacity to condense starch-forming compds. S. MORGULIS

Condensation of fatty substances on the surface of mitochondria. R. NOËL. *Compt. rend.* 174, 572-3(1922).—Morphologically it seems that the fat first appears at the periphery of the mitochondria in the form of very small granulations which later flow into a ring. L. W. RIGGS

Formation of anthocyanin pigments. RAOUL COMBES. *Compt. rend.* 174, 240-2 (1922); cf. C. A. 16, 1450 and St. Jonesco, C. A. 16, 1450.—The differing conclusions stated by C. and Jonesco are attributed to the fact that J. worked upon phlobatannins and not upon γ -pyronic pigments; consequently J.'s conclusion that the anthocyanic pigments are produced by oxidation is not accepted. L. W. RIGGS

Testing for the adulteration of the juices of *Vaccinium oxycoccus*. GRETA BORÉNUS. *Hyllningskrift tillägnad Ossian Aschan* 1920, 110-7(1920).—Analysis of the raw juice: sp. gr. 1.028, alc. by vol. 1.71%, ext. 7.72%, free acid calcd. as anhyd. citric acid 2.88%, volatile acids calcd. as acetic acid 0.114%, ash 0.241%, alky. as cc. of N acid per 1 g. of ash 7.8 cc., color with Pb acetate blue gray. Samples of sweetened juices were made up and analyzed as the above raw juice. Then a number of juices were purchased and tested for adulteration by analyzing and comparing the results with the above figures. C. E. CARLSON

The occurrence of rutin in the leaves of the *Boronia* (Rutaceae). F. R. MORRISON. *J. Proc. Roy. Soc., N. S. Wales* 55, 210-14(1921).—*B. serrulata* and *B. thujona* obtained near Sydney, also *B. pinnata* from the northern district of N. S. W., were used. The leaves, after the oil was distilled, were dried, ground, and boiled with H_2O . The hot liquid was filtered through cloth and the leaves were again treated with H_2O . On cooling, the dye material (rutin) separated. It was filtered, dried and weighed. The yields in percentage of the fresh material were as follows: *B. serrulata* 1.6% and *B. thujona* 0.7%. The prepn. of the substance in a pure condition was carried out according to the method of H. G. SMITH, *Trans. Chem. Soc.* 1898, 698. The crude material was recrystallized from boiling H_2O , dried, ground, and extd. with EtO. The powder was then dried and boiled with abs. EtOH, filtered, evapd., and poured in H_2O where the substance was pptd. It was recrystallized from dil. EtOH and several times from H_2O . The pure substance softened at 185° and melted with decompn. at 200°. Combustion data and color tests are given. The calcd. formula was $C_{27}H_{32}O_{16}$, that of rutin. A hydrolytic product identical with that of quercetin was obtained. Glucoaszone and rhamnose osazone crystals were prepd. from the quercetin filtrate. The 2 sugars and the quercetin obtained show that the yellow dye material is identical with rutin. F. C. COOK

Indicator method of estimating the vitality of seeds by a biochemical process. ANTONIN NĚMEC and FRANTIŠEK DUCHON. *Compt. rend.* 174, 632-4(1922); cf. C. A. 16, 1450.—Oats and peas were tested by mixing 2 g. of finely ground seed with 20 cc. distd. H_2O in a flask provided with a 2-holed rubber stopper carrying a funnel with stop-cock and a delivery tube passing into a pneumatic trough furnished with graduated receiver. By the funnel 15 cc. of H_2O_2 (3 in 100 and previously neutralized) was introduced and the vol. of O evolved measured at the end of 5 and of 15 min. The control was manipulated in the same manner except that the flour and H_2O mixt. was heated for 20 min. on a boiling water bath before adding the H_2O_2 . Seeds from various years from 1891 to 1920 were thus tested. The germinative capacity of the seeds ranged from 0 for the 1891 seeds to 100% for the 1920, and the O evolved ranged from 4.1 to 78.6 cc. O evolved by the control was never above 3.9 cc. With seeds from the seasons 1891 to 1915 there was a quite close parallelism between germinative capacity and O evolved in 5 min. From 1915 to 1920 the germinative capacity rose from 85 to 100% but the O

evolved rose from 77.1 to 78.6%. The results with peas were quite parallel to those with oats. L. W. RIGGS

Action of soluble lead salts on plants. EUGENE BONNETT. *Compt. rend.* 174, 488-91(1922).—Solns. were made by dissolving 331 g. of carefully purified $\text{Pb}(\text{NO}_3)_2$ or 379 g. of $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 3\text{H}_2\text{O}$ in redistd. H_2O . The concns. used contained 1 g. mol. of the salt in 1000 to 2000 l. of water. Tests were made in wide-mouthed 160 to 200 cc. flasks closed by paraffined paper with a hole for the passage of the root. Plants subjected to 0.1 N solns. absorbed Pb only in the bark of the root. Pb removed by the plant was found in the ash of the roots, only traces appearing in the stalk and leaves. Pb solns. of 0.1 N concn. killed wheat seedlings in 20 days, buckwheat in 7, lupine in 4, and balsam in 2. Salts of Mg, Ca, or K were not antitoxic to 0.1 N Pb. Increased diln. of the Pb salt was accompanied by decreased absorption. Pb salts diminished transpiration and arrested the growth of the stem, but the root continued to grow at a slower rate than in water. L. W. RIGGS

E—NUTRITION

PHILIP B. HAWK

NORMAL

Nutritive value of edible oils and fats. J. C. DRUMMOND AND S. S. ZILVA. *Soc. Chem. Ind.* 41, 125-7T(1922).—Studies on rats to det. vitamin A content of various crude seed oils. When fed to rats as a supplement to a diet free from vitamin A, palm kernels, soy beans, cottonseed, arachis (peanut), rape, fennel, babassu, kapok, cohune, djave, citician, rangoon beans, cacao, candle nuts, copra and maize both (white and yellow) supplied as the whole seed did not furnish enough vitamin A to promote normal growth while linseed was able to bring about fairly satisfactory growth. Linseed oil obtained both by extn. and expression as well as crude palm kernel, soy bean, peanut, djave, maize (yellow) and rape oils failed to furnish sufficient vitamin A for normal growth. Crude palm oil was found to have a relatively high concn. of vitamin A. "An attempt to prepare from this oil a fraction consisting of unsaponifiable constituents suitable for raising the vitamin value of vegetable oil margarine was unsuccessful, since the product, while highly potent from a vitamin standpoint, was unpalatable." H. J. DRUET, JR.

Comparative antiscorbutic values of milk. J. M. JOHNSON AND C. W. HOOPER. U. S. Pub. Health Ser., *Pub. Health Repts.* 37, 989-1021(1922).—Expts. on guinea pigs to det. the antiscorbutic value (vitamin C) in raw, pasteurized and dried milk. Fresh milk does not contain a very large content of vitamin C. Drying had a destructive effect on vitamin C although one brand of milk powder retained to a large degree its antiscorbutic power. Pasteurization destroyed the vitamin C content to about the same degree as drying while one brand of certified milk was only slightly more potent in the vitamin. The authors conclude that "no milk is trustworthy to prevent scurvy when the animal is not forced to consume large amts. daily." H. J. DRUET, JR.

Chemical characteristics of alimentation. T. B. OSBORNE AND L. B. MENDEL. *Bull. soc. hyg.* 10, 5-11(1922).—A discussion of earlier expts. of the authors on isolated proteins and a general description of the role of vitamins in nutrition. H. J. D. JR.

Value of gelatin in relation to the nitrogen requirements of man. ROBERT ROSSON. *Biochem. J.* 16, 111-130(1922).—Three diet expts. using low, medium and high amts. of gelatin N in addn. to the basal diet were conducted. Can the minimum N loss on abundant N-free diet be still further reduced by gelatin, and if so, what relation does the amt. of this reduction bear to the amt. of gelatin ingested? R. was the subject of the expt. The basal diet consisted of corn starch, lactose, sucrose and a salt mixt.

This diet, supplemented by different quantities of gelatin, was taken for periods of 10 days, the N intake being kept const. during that period. Minimum quantities of lemon juice and cod liver oil were also added to the diet. In the first expt. the total N intake was 12.23 g., of which 12.00 was gelatin. The av. N balance for the period of 10 days was -2.40 (that is, the av. total N, in urine and feces, was 14.63 g. which, subtracted from the N intake, 12.23 g., gives -2.40). In the 2nd expt. the exptl. period was divided into 2 parts: During the first 3 days the basal diet was supplemented by egg white (N in this form equalled 5.0, and the total N intake was 5.21); and during the last 10 days this was replaced by gelatin (N in this form equalled 4.88, and the total N intake was 5.10). A pronounced negative balance occurred on the egg white, and on the gelatin the av. for the whole period was -2.75 . In the 3rd expt. the N intake was 7.75 (N in form of gelatin, 7.54; N in accessories, 0.21). The av. N balance was -2.68 . In attempting to calc. the amt. of body protein spared by the gelatin, the part of the intake due to the N of the accessories and that part of the N output due to the feces are considered. If one assumes that the min. N requirements are represented by the sum of the N in the urine and that in the feces on the N-free diet, and that the difference between the latter amt. and the corresponding excretion on the gelatin diet represents unabsorbed N, then the max. saving in terms of N min. is 11.9%; if the gelatin is completely absorbed and the min. requirements for such periods are represented by the output in the urine on "N-free" diet plus the N in the feces on the gelatin diet, then the max. saving is 15.9%.

BENJAMIN HARROW

Vitamins on the farm—their practical relation to livestock feeding. ALVIN R. LAMB AND JOHN M. EVVARD. Iowa Agr. Expt. Sta., *Circ.* 73, 8 pp. (1922).—The fundamental requirements of nutrition are discussed and the importance of vitamins and other factors in nutrition under practical farm conditions are defined. The results of a practical test on growing pigs with a white corn ration are described and illustrated. The deficiencies of this ration were made good by adding one spoonful of butterfat per day to the ration.

A. R. LAMB

The influence of putrefaction products on cellular metabolism. II. The influence of phenylacetic and phenylpropionic acids on the distribution of nitrogen in the urine. YOSHIZUMI HIRIKATA. *J. Biol. Chem.* 51, 141-54 (1922).—Rabbits were used and the neutralized acids were introduced by means of the stomach tube or injected subcutaneously. With small doses there was a considerable increase in the amino acids in the urine but the amt. of total N and of NH_4 was not essentially changed. There was an insignificant decrease in the urea output. With larger doses an increase in total N occurred together with marked increase in both the absolute and relative amts. of NH_4 and amino acids. There was also a rise in the amt. of urea but not in proportion to the total N. The fact that the increase in amino acids was accompanied by a decrease in the relative amt. of urea "suggests the possibility that the amino acids may arise from urea or its antecedent. The results may be of importance in clarifying the conception of the formation of glycocoll in the animal body, no exptl. reduction of the urea in the urine having been observed heretofore, on introducing BzOH or analogous substances. The increase in NH_4 , even though the acids were neutralized when ingested, favors the view that the simultaneous increases in the quantities of total N and urea excreted may have been due to a pathological decompn. of tissue proteins. These changes were observed not only with rabbits maintained in N balance but with fasting animals."

A. P. LOTHROP

Choice between adequate and inadequate diet, as made by rats and mice. H. S. MITCHELL AND L. B. MENDEL. *Am. J. Physiol.* 58, 211-25 (1921).—When rats or mice are allowed free choice in selecting food between adequate and inadequate "synthetic" diets, as a rule the selections made are advantageous for their nutritive condition.

The choice involved was between two diets, one fully adequate, the other inadequate in some one dietary essential such as protein, minerals, vitamin A or vitamin B. Rats fed corn, meat meal and minerals separately and *ad libitum* made excellent growth, the protein content of the food mixt. consumed ranging from 12 to 25%. J. F. LYMAN

Fat soluble vitamin. IX. Incidence of an ophthalmic reaction in dogs fed a fat-soluble vitamin deficient diet. H. STEENBOCK, E. M. NELSON AND E. B. HART. *Am. J. Physiol.* 58, 14-9(1921); cf. *C. A.* 15, 3306.—The daily diet consisted of 200 cc. centrifuged milk which had been heated 1 hr. at 15 pounds steam pressure, 5 g. $\text{Ca}(\text{PO}_4)_2$, 2 g. NaCl, 5 g. casein and a mash consisting of equal parts rolled oats and white corn meal, cooked 1 hr. at 15 lbs. pressure, *ad libitum*. Two dogs on the above diet plus cod liver oil remained healthy. Three dogs on the basal diet without supplement died or became diseased within 69 to 94 days, one of them showing the characteristic symptoms of ophthalmia. This dog was cured by the daily administration of an ether ext. of 30 cc. of saponified cod liver oil. Two dogs led the basal diet plus 20 g. of fresh cabbage daily developed ophthalmia in 67 and 83 days. One of these was cured by the daily administration of 20 cc. of cod liver oil. J. F. LYMAN

Studies in nutrition. VII. The nutritive value of the proteins of the adsuki bean, *Phaseolus angularis*. C. O. JOHNS AND A. J. FINKS. *Bur. Chem., U.S. Dept. Agr., Am. J. Physiol.* 56, 208-12(1921).—Raw or cooked adsuki bean meal supplemented with cystine furnished adequate protein and water-sol. vitamin for normal growth. Similar diets without the addition of cystine enabled albino rats to grow at only $\frac{1}{3}$ to $\frac{1}{4}$ the normal rate. Comparable results were obtained with the isolated adsuki bean globulin. J. F. LYMAN

A chemical study of the proteins of the adsuki bean, *Phaseolus angularis*. D. BREESH JONES, A. J. FINKS, AND C. E. F. GERSDORFF. *J. Biol. Chem.* 51, 103-14 (1922); cf. preceding abstract.—The adsuki bean is one of 5 oriental species of beans which have been introduced into the U. S. and next to the soy bean it is the most important legume grown in Japan. It contains about 21.13% of N of which 16.7% is extd. by 5% NaCl soln. By fractional pptn. of the NaCl ext. with $(\text{NH}_4)_2\text{SO}_4$ two globulins may be obtained. A small amt. of albumin (0.05% of the original meal) remains in the distd. H_2O exts. of the bean after the globulins are removed. The α -globulin contains 15.64% of N and 1.21% of S and the β -globulin 16.46% of N and 0.40% of S. The following percentages of basic amino acids were found in the α - and β -globulins, resp.: arginine 5.45 and 7.00, histidine 2.25 and 2.51, lysine 8.3 and 8.41, and cystine 1.63 and 0.83. Both globulins gave positive tests for tryptophan and 2.13% of tyrosine was isolated from the β -compd. These globulins are similar in their properties and compn. to those isolated from other beans of the *Phaseolus* genus. A. P. LOTHROP

Carotinoid pigmentation of the skin resulting from a vegetarian diet. HIRO-TOSHI HASHIMOTO. *J. Am. Med. Assoc.* 78, 1111-2(1922); cf. Hess and Myers, *C. A.* 14, 3707.—H. reports that pigmentation of the skin has long been observed among vegetarians in Japan, especially those eating *Citrus nobilis*, or unusual amts. of squash, the latter being a partial substitute for rice among the farmers of northern Japan. L. W. RIGGS

Experimental studies with proprietary vitamin products. J. H. HESS, J. J. MOORE AND J. K. CALVIN. *J. Am. Med. Assoc.* 78, 1441-5(1922).—Guinea pigs fed hay, oats and water or milk developed scurvy in 2 to 5 weeks and died 3 to 6 weeks later unless orange juice was added to their diet. Pigs receiving the above-mentioned diet and 1.3 g. of "Metagen" per day in every instance developed scurvy in from 2 to 4 weeks later unless protected by the addn. of orange juice to the diet. The addn. of "Mastin's Vitamin Tablets," in doses $\frac{1}{4}$ that recommended by the manufacturers for adult human use, was followed in every case by the development of scurvy in 14 to 16 days.

A product contg. dried orange juice and desiccated pig liver was investigated at the request of the manufacturer and found to cause diarrhea and loss of wt. in the 3 animals studied, one of which developed scurvy and the other 2 dying within 7 days. The 2 proprietary preps. above-mentioned were tested with pigeons, fed a diet of polished rice and water, and were found to delay but not prevent the onset of polyneuritis. "Yeast Vitamine-Harris Tablets" prevented and cured polyneuritis in a manner similar to that of fresh yeast. One-twelfth of a cake of fresh com. yeast daily was sufficient to protect against the disease, while the equiv. of 3 cakes daily of the Harris product was required. The process of manuf. and aging of concd. vitamin products have not caused as much loss of the antineuritic as of the antiscorbutic properties. Vitamins should be obtained through the proper selection of foods, not from the drug store. L. W. RIGGS

Significance of lime for the organism. EMIL STARKENSTEIN. *Umschau* 26, 209-11 (1922).—In this address the importance of Ca in the various processes of animal life is reviewed, also the pathol. conditions arising from insufficient Ca in the diet.

L. W. RIGGS

The substitution of protein by urea in sheep and milk-producing animals. Feeding experiments carried out in 1918-20 at the Württem Agricultural Experiment Station at Hohenheim. A. MORGEN, G. SCHÖLER, K. WINDHEUSER AND ELSA OHLMER. *Landw. Vers. Sta.* 99, 1-26 (1921).—The authors believe that it is possible to substitute 30-40% of urea for protein in a normal ration contg. protein. Whether such a substitution is practical or not depends upon the price and quantity production of urea.

F. M. SCHERTZ

Digestion experiments with albumoses prepared with the aid of alkali. H. LANG-ECKER. *Z. physiol. Chem.* 115, 130-38 (1921).—Varying degrees of digestibility (*in vitro*) were observed, depending evidently upon the extent of racemization. R. L. S.

Vitamin B and coenzymes. II. H. v. EULER AND K. MYRBÄCK. *Z. physiol. Chem.* 115, 155-69 (1921); cf. *C. A.* 16, 263.—Euler and Myrbäck have made an attempt to measure the vitamin B content of the food and of the excreta (urine and feces) in order to det. the vitamin requirement of man. As a basis for their measurements they utilized the effect of the materials studied in accelerating the CO₂ production by a standardized dried yeast prepn. Complications arise because of the presence of inhibitory substances as well as of the vitamin in question. The data are of a preliminary nature, but they appear to indicate that a noteworthy quantity of vitamin B is used up daily.

R. L. STEHLE

Nuocleïn metabolism. XIII. Intermediary uricolysis in man. S. J. THANN-HAUSER AND H. SCHABER. *Z. physiol. Chem.* 115, 170-79 (1921); cf. *C. A.* 16, 278 and Rother, *C. A.* 15, 1744.—Five persons with normal kidneys received subcutaneous injections of 1 g. of adenosine or guanosine. In four of them the percentages recovered in the urine as uric acid were 120, 117, 89 and 101%, resp. From the 5th subject (whose father was a sufferer from gout) after 2 injections of adenosine only 47 and 61% could be accounted for and after guanosine only 36%.

R. L. STEHLE

ABNORMAL

Acute and latent avitaminosis. H. SIMONNET. *Bull. soc. hyg.* 10, 26-39 (1922).—A description of expts. of McCollum previously reported (cf. *C. A.* 15, 2657).

H. J. DEUEL, JR.

Objects and method of diet adjustment in diabetes. R. T. WOODYATT. *Arch. Intern. Med.* 28, 125-41 (1921).—The difference between food intake and metabolized material is emphasized. Complete starvation in diabetes appears to be undesirable for it compels utilization of body fat and protein instead of fat that could be ingested with practically no increase in total metabolism. Assuming that 1 mol. of fatty acid

requires 1.5 mols. of glucose for complete combustion, W. calculates from the data in the literature on fats, amino acids, etc., that the max. amt. of fat that can be burned in the body = $2 C$ (utilizable carbohydrate) + $0.84 P$ (protein). W.'s experience indicates that this is very nearly the true relation. Examples of the use of the equation in calculating from C , when known, the max. permissible total metabolism, etc., are given. Cf. Shaffer, C. A. 15, 3307; 16, 741; Wilder, Boothby and Beeler, C. A. 16, 1798.

I. GREENWALD

The dietary requirements in pulmonary tuberculosis. WM. S. McCANN. *Am. Rev. Tuberculosis* 5, 870-5(1922); cf. C. A. 16, 579, 737.—The aim has been to devise a diet which will increase as little as possible the vol. of respiration and the circulation rate through the lungs, in order to limit the functional demands upon an injured organ. High protein diets greatly increase the metabolism and consequently enlarge the demands upon the cardiorespiratory mechanism. They produce undesirable effects upon the digestive and excretory systems as well. While N balance may be attained on a low protein diet, this is only possible when the protein metabolism is spared by an excessive ingestion of non-protein food, chiefly carbohydrate. The effect of a carbohydrate-rich diet is to increase greatly the breathing vol. Fat, which is metabolized with the greatest economy of respiratory function, is not so efficient as carbohydrate in sparing protein. Most individuals have a limited capacity for utilizing fat. If fat is well tolerated, however, it is well to keep in mind the necessity of maintaining a sufficient supply of carbohydrate to prevent the development of acidosis. From the data obtained by Shaffer (C. A. 15, 3307) and Woodyatt (preceding abstr.), a diet furnishing about 2500 cal., 60 to 90 g. of protein and 200 g. of fat would require about 100 g. of glucose or other carbohydrate ($1/4$ of total cal. derived from carbohydrates). It would be well to set $1/4$ of the total cal. as the min. for the proportions of carbohydrates in the diet. Satisfactory nutrition may be attained by the use of a moderate quantity of protein (60 to 90 g. per day), with the use of fat up to the limits of digestive capacity, and sufficient carbohydrates to bring the total caloric value of the diet to from 2500 to 3000 cal. From the standpoint of diminishing the sp. dynamic effects of foods, there is an advantage in dividing the diet into more than 3 meals. H. J. CÖRPER

Studies on experimental rickets. XV. The effect of starvation on the healing of rickets. E. V. McCOLLUM, NINA SIMMONS, P. G. SHIPLEY AND E. A. PARK. *Bull. Johns Hopkins Hosp.* 33, 31-3(1922).—Rickets was induced in young rats by feeding a diet consisting of 33% wheat, 33% maize, 15% gelatin, 15% wheat gluten, 1% NaCl, 3% CaCO_3 for from 35 to 40 days. Subsequent starvation of from 3 to 5 days, although it sometimes killed the rats, led to definite reformation of the provisional zone of calcification and other evidences of the healing of the rachitic process. J. GREENWALD

Rickets: the part played by unhygienic social conditions in predisposing to the disease. D. NOEL PATON. *Glasgow Med. J.*, n. s. 15, 129-44(1922).—P. does not believe that defective diet and unhygienic surroundings are direct causes of rickets. The possibility of an infective agent is to be considered. F. S. HAMMETT

Rickets in India. H. S. HUTCHISON. *Glasgow Med. J.*, n. s. 15, 145-58(1922).—H. gives a comparison of the diets of the lower and higher paid workers in India. Both early and late rickets occur in that stratum of society which enjoys the better dietary, but in which the seclusion of women and children is adopted. The condition is rarely found among the poorer classes where "purdah" is not practised. Therefore seclusion is given as a cause of rickets. F. S. HAMMETT

ELLIS, C. and MACLEOD, A. L.: *Vital Factors of Foods: Vitamins and Nutrition*. New York: D. Van Nostrand Co., 8 Warren St. 500 pp. \$5.

MCCOLLUM, ELMER V.: *The Newer Knowledge of Nutrition*. 2nd Ed. revized. New York: McMillan Book Co. \$3.80.

F—PHYSIOLOGY

ANDREW HUNTER

Mammary secretion. III. G. A. HARTWELL. *Biochem. J.* 16, 78-105(1922); cf. C. A. 16, 735.—"In a lactating rat, the amt. of dietary protein constituting excess varies with the type of protein and with the individuality of the rat. The proportion 15.0 g. bread to 1.0 g. protein (egg albumin or caseinogen) fed to the mother results in abnormal symptoms in the litters. Large quantities of protein fed to a nursing rat are detrimental to the young, even when the diet contains all the essential elements. The litters die at approx. the same time, irrespective of the length of time the mother has been fed on the excess protein diet. It is suggested that the toxic substances in the milk affect the baby rat at some special stage of development. A diet contg. large amts. of protein (15.0 g. bread to 5.0 g. protein) is a physiologically complete mixt. is adequate for growth, fertilization and reproduction in the rat, and is unsuitable only during lactation. The bad effects are obviated by adding 100 cc. whole milk to the mother's diet. The addn. of hutter and lactose causes no improvement in the young when the mother is eating large quantities of edestin or caseinogen. Yeast ext. (marmite) in large amts. added to the excess protein diet prevents all bad symptoms in the case of caseinogen and edestin; with egg albumin the bad condition is improved, but not entirely cured."

BENJAMIN HARROW

Effect of severe muscular work on composition of the urine. J. A. CAMPBELL AND T. A. WEBSTER. *Biochem. J.* 16, 106-110(1922); cf. C. A. 16, 740.—A healthy subject accustomed to do 67,500 kg. of work on a bicycle ergometer in 5 hours developed symptoms of muscular strain on attempting to do 100,000 kg. of work in 5 hours. There were pathol. changes in the urinary compn. Creatinine, undetd. N, neutral S and lactic acid were much increased, while "acetone bodies" were present during part of the expt.

BENJAMIN HARROW

Distribution of the nitrogeous constituents of the urine on low nitrogen diets. ROBERT ROBISON. *Biochem. J.* 16, 131-33(1922).—A diet consisting of corn starch, sucrose, lactose, honey, and hutter, together with a little lemon juice, inorg. salts and agar-agar, was taken during 7 days. The fuel value of this diet was equal to 44-52 cal. per kg. body wt. and the N content was about 0.3 g. This period was followed by another of 5 days during which the same basal diet with the addn. of a little milk was taken, the N intake being raised to about 3 g. The results are in complete agreement with Folin (*Am. J. Physiol.* 13, 117(1905)) respecting the variation in the distribution of the urinary N. The creatinine was practically const. and was equal to 7.3 mg. for one subject and 8.2 for another per kg. body wt.

B. HARROW

Hemocyanin. C. DHÉRÉ AND A. SCHNEIDER. *Compt. rend. soc. biol.* 83, 1505-7 (1920); cf. C. A. 14, 1139, 2211; 15, 867; 16, 1438.—The investigations were made on the blood of crayfish, crab, and cuttle-fish. As in the case of the snail and lobster, complete reduction occurs on aeration with an indifferent gas, also by exhaustion and heating. A green compd. was formed with NO and snail hemocyanin, but not with lobster hemocyanin. In the crayfish, the compd. is formed in small quantities by long passage of the gas. Larger quantities are formed in the cuttle-fish. Prepns. from snail hemocyanin gradually assume a yellow color.

J. C. S.

Chemical modifications of the vagus nerve during digestion. M. LOEPFER, R. DEBRAY AND J. TONNET. *Compt. rend. soc. biol.* 84, 819-20(1921).—The left vagus nerve in dogs alone among nerves has a varying NaCl content. It is greater during a meal.

J. C. S.

The amount of amino acids in blood. K. DE SNOO. *Diss. Utrecht* 1920, 130 pp.—The amt. of N due to amino acids in human blood is, on an av., 6.8 mg. per 100 cc. This

amt. increases after a protein meal, as also does the amino acid content of the urine. Absorption of amino acids probably ceases six hours after a meal. Details of the variation of the amino acid content of the blood in cases of certain diseases are given.

J. C. S.

Composition of horn and epidermis. P. G. UNNA. *Med. Klinik* 16, 1278-7 (1920).—The epidermis of animals consists of keratin-A, which does not give the xanthoprotein reaction and is insol. in fuming HNO_3 , keratin-B, which gives a yellow color and eventually dissolves, keratin-C, which gives a yellow color, but does not dissolve, and horn-albumoses, which dissolve at once with the production of a yellow color. Keratin-A forms the dry external portions of epidermal cells, keratin-B and the albumoses the contents of these cells. The epidermis of hairy mammals and birds consists principally of keratin-C, together with keratin-A and albumoses; that of reptiles contains more keratin-B, together with keratin-A and albumoses. In the epidermal layer of humans, the horn albumoses preponderate, together with keratin-A and -B. The keratins confer hardness while the albumoses have the contrary effect. In the horns of cattle the ratio of keratin-B to albumoses is five times as great as in the epidermis of humans. The latter, although protective, is on account of its compn. permeable and reactive. It contains 13% of keratin-A, 10% of keratin-B, and 77% of albumoses.

J. C. S.

Formation and excretion of hippuric acid in man. I. SNAPPER. *Nederl. Tijdschr. Geneesk.* 65, 3044(1920).—Hippuric acid in amts. up to 300 mg. daily was found in the urine of persons on a milk diet. The source of the benzoic acid necessary for its formation is probably phenylalanine, produced by the digestion of proteins. In men with normal kidneys, 5 g. of N_2 benzoate were almost completely excreted in the form of hippuric acid within 12 hrs. From a study of certain pathological cases the conclusion is drawn that the glycine depot of the body is not dependent on the bile secretion.

J. C. S.

Fat transport in the animal body. W. R. BLOOR. *Physiol. Rev.* 2, 92-115(1922).—A review in which transport of fat across the intestinal wall, transport to the blood, to the tissues and from the tissues to the blood are considered. Histological as well as chem. evidence is summarized. The prevailing belief that fats are completely hydrolyzed in the intestine and absorbed as the hydrolysis products has most of the evidence in its favor, although the possibility of the absorption of some unchanged fat cannot be excluded. There is no need to assume a special mechanism for the transfer of fat from the intestinal lumen into epithelial cells, which takes place by hydrolysis and absorption of the products in aq. soln. The products taken up by epithelial cells are converted into fat and either passed on at once to the lacteals or are stored temporarily. Probably the primary hydrolysis in the intestine and synthesis in the epithelial cells are the changes which the fat undergoes in its passage across the intestinal wall, further transport to the lacteals and thence to the blood being either as particulate matter in a state of fine subdivision or by transformation into water-sol. substances of the nature of lecithin. Both methods are probably employed. Evidence regarding absorption directly into the blood stream from the intestine is contradictory; the probability is that some of the fat is absorbed in this way. As regards transport from the blood to the tissues there is considerable evidence of an indirect nature that lecithin in the blood is the main form of transport of fat and the precursor of fat in the tissues, and conversely that fat in the tissues is changed to lecithin on entrance to the blood. The main form in which lipid is stored in the organism, however, is fat. There is a tendency for const. values for the lipoids of the blood. When lipemia occurs, not only the fat, but also the lecithin and cholesterol, are above normal.

E. R. LONG.

The effect of loss of carbon dioxide on the hydrogen-ion concentration of urine.

R. K. MARSHALL, JR. *J. Biol. Chem.* 51, 3-10(1922).—The effect of loss of CO_2 on the H-ion concn. of urine is very slight if the urine is acid, except where it is very dil. in which case the effect may be quite pronounced. Change of reaction in concd. urine is prevented by the efficient concn. of the buffers present while in dil. urine the carbonate is markedly increased in abs. amt. and generally in %. The error due to escape of CO_2 in neutral or alk. urine is very great. The lowest H-ion concns. which have been reported are very likely too low, owing to neglect of precautions to avoid escape of CO_2 . When the proper precautions are taken the intravenous injection of Na_2CO_3 into dogs in large amts. yield samples of urine of only p_H 8.0 and it is probable that the urine of man is never of an alkalinity higher than p_H 8.0. It is probable that the CO_2 tension of urine will be found to bear a simple relation to that of the alveolar air. With this relation established, it would be an easy matter to equilibrate samples of urine to the proper tension and det. the H-ion concn. with great accuracy.

A. P. LOTHROP

Studies in carbohydrate metabolism. III. A study of urinary sugar excretion in twenty six individuals. ISAAC NEUWIRTH. *J. Biol. Chem.* 51, 11-6(1922); cf. C. A. 12, 1310.—The majority of the subjects were medical students and two 24 hr. samples of urine were obtained from each individual. The samples were analyzed for reducing substances both before and after fermentation with yeast. The total sugar output of normal individuals varied from 0.614 to 1.383 g., av. 0.941 g., the fermentable reducing substance from 0.134 to 0.488 g., av. 0.334 g. and the non-fermentable from 0.370 to 1.024 g., av. 0.607 g. The non-fermentable sugar amounted to from 51 to 86% of the total sugar. The abs. % of sugar before fermentation varied from 0.037 to 0.208% and after fermentation from 0.027 to 0.112%. 1.38 g. of total sugar should be regarded as the max. output for a normal adult on an ordinary diet. In all cases the results obtained after fermentation were lower than before fermentation, showing that normal urine does contain a reducing fermentable substance. The amt. of sugar excreted was quite independent of the vol. of the urine. The normal output is markedly influenced by the diet, being reduced by restriction in food intake and increased by ingestion of excess of carbohydrates. Results obtained on samples of urine from a boy of 13 were similar to those reported for adults. One subject whose mother was diabetic excreted on 2 of the 4 days recorded 1.45 and 1.97 g. of total sugar, amts. above that being regarded as normal. Whether this was due to a "diabetic tendency" or to the extremely liberal diet is an open question.

A. P. LOTHROP

Calcium in egg-shell formation. G. D. BUCKNER, J. H. MARTIN, W. C. PIERCE AND A. M. PETERS. *J. Biol. Chem.* 51, 51-4(1922).—"The hen can utilize the Ca in CaCO_3 for the production of both egg-shell and bones but the Ca in $\text{Ca}_3(\text{PO}_4)_2$ can only be utilized for the growth of bone and not for egg-shell production. Ca starvation is not the detg. factor in the production of shell-less eggs."

A. P. LOTHROP

Studies on the amino-acid nitrogen content of the blood. SHIZABURO OKADA AND TOWORU HAYASHI. *J. Biol. Chem.* 51, 121-33(1922).—The amino-acid N content of the blood of 28 fasting dogs was found to vary from 8.33 to 8.79 mg. per 100 cc. In rabbits the amt. is somewhat higher, from 7.22 to 10.6 mg. Anesthesia, removal of the thyroid gland, hyperthyroidism, or hypodermic injection of adrenaline or pituitrin have no effect upon the amino acid N content. A transient increase, caused by thorough removal of the pancreas, begins within a few hrs. and lasts for at least 2 days after which it diminishes again and may even become subnormal. If part of the pancreas is left under the skin with its blood supply intact, the amino N remains normal. Extirpation of both kidneys or ligation of both ureters causes a marked increase which is parallel to the increase in urea and total non-protein N. Hypodermic injection of pilocarpine causes an increase. In leucemia there is an increase which is parallel to the number of white corpuscles. The white blood cells in leucemia contain 6-7 times as

much amino acid N as the plasma. The suggestion is made that the nuclei of the white corpuscles are especially rich in amino acids though this fact has not been definitely established.

A. P. LOTHROP

The hydrogen-ion concentration of the intestinal contents. SHIZABURO OKADA AND MINORU ARAI. *J. Biol. Chem.* 51, 135-9(1922).—Electrometric exams. were made of the duodenal contents of various hospital patients removed with an Einhorn duodenal tube and of the duodenal and ileal contents of dogs. Of 11 samples obtained under fasting conditions, 8 were alk. and 3 acid with H-ion concns. of from 2.6×10^{-7} (p_H 6.59) to 1.3×10^{-8} (p_H 7.9). In 12 other cases in which food had been given, 7 were acid, 4 alk. and 1 neutral with H-ion concns. of from 1.6×10^{-4} (p_H 4.8) to 1.1×10^{-8} (p_H 7.97). Tests for free HCl were always negative and there was no relation between the acidity of the gastric contents and the reaction of the duodenal contents. In dogs receiving 1 lb. of meat some samples of duodenal and ileal contents were acid and some alk. The action of microorganisms seems to affect the reaction of the ileal contents.

A. P. LOTHROP

The cleavage products of the crystalline lens. YOSHIZUMI HIJIKATA. *J. Biol. Chem.* 51, 155-64(1922).—The hydrolysis of the cryst. lens of the ox yielded the following % of amino acids: alanine 4.7, valine 1.0, leucine 6.8, aspartic acid 1.4, glutamic acid 15.5, lysine 1.6, arginine 3.3, phenylalanine 1.9, tyrosine 4.5, proline 2.2, histidine 1.6, tryptophane present. The relative amt. of glutamic acid is surprisingly high, owing in part to its direct isolation from a sep. hydrolysis mixt. An amt. of adenine picrate was obtained from 1.025 g. of lens sufficient only for a m. p. detn. and no xanthine or hypoxanthine was present.

A. P. LOTHROP

Do amino acids occur in cow milk? YOSHIZUMI HIJIKATA. *J. Biol. Chem.* 51, 165-70(1922).—The following amino acids have been isolated and identified by working up 200 l. of fresh milk: histidine as picrolonate, arginine and lysine as picrates. Cu salts of proline and glycocoll were also obtained but not in sufficient amts. for analysis. Glutamic acid is probably also present. In addition to these amino acids guanine and adenine were found in the purine base fraction and choline in the lysine fraction. The presence of amino acids as physiol. constituents of milk has, therefore, been proved by direct isolation rather than by assumption from the detn. of amino N by the Van Slyke method.

A. P. LOTHROP

The ammonia content of blood. T. P. NASH, JR. AND S. R. BENEDICT. *J. Biol. Chem.* 51, 183-5(1922).—The suggestion has been made that the increased NH_3 found by N. and B. (*C. A.* 16, 117) in blood of the renal vein may be due to return of previously excreted NH_3 from a kidney which has ceased to function normally under the exptl. conditions necessary in drawing the blood. In the original expts. the blood was taken from the renal vein without even a temporary stoppage of the renal circulation and more NH_3 was found, *without exception*, whether the blood was taken early or late in anesthesia. Furthermore, in dogs diabetic from phlorhizin which had been under Et_2O anesthesia for 2 hrs., there was either no change or a definite decrease in the sugar concn. of the renal blood accompanied by an increase in the NH_3 content (in one case of nearly 300%). These facts further substantiate the conclusion that NH_3 is formed by the kidney.

A. P. LOTHROP

Some new observations and interpretations with reference to transportation, retention, and excretion of carbohydrates. OTTO FOLIN AND H. BERGLUND. *J. Biol. Chem.* 51, 213-73(1922).—The ingestion of pure glucose up to 200 g. does not raise the blood sugar level above the threshold in normal persons and no glucosuria occurs provided emotional complications or a subnormal threshold (renal glucosuria) are absent. Fructose, galactose, lactose, dextrin and starch are much less effective in raising the blood sugar level than glucose. The reason for the failure of the sugar to accumulate in the

blood is probably the absorption of sugar from the blood by the tissues rather than glycogen formation. A renal threshold for fructose similar to that for glucose exists but there is no such threshold for either galactose or lactose. The extent to which galactose is retained and utilized by the human organism depends on the amt. of available glucose. The sugar excretion is less than $1/10$ as great when 100 g. each of glucose and galactose are taken as when 100 g. of galactose are ingested alone. Hypoglycemia is probably quite as normal a consequence of carbohydrate ingestion as hyperglycemia, but occurs later. It is an index of a decreased need for sugar transportation from one set of tissues to another when there is an abundance of available carbohydrate material in all the tissues. It may also be produced, therefore, by an abundance of other suitable food, notably fat. In venous blood hypoglycemia can occur even during prolonged moderate sugar absorption from the intestine because the absorbed sugar may get to the liver but does not get into the venous blood. Definite "glycuresis" occurs after every ordinary carbohydrate meal and is independent of the blood sugar level and does not normally result from the ingestion of pure glucose, maltose, dextrin or starch. The glycuresis represents the absorption and excretion of foreign unusable carbohydrate materials present in grains, vegetables and fruits and also the decompn. products due to cooking, canning and baking of such food. The sugar of normal urine consists, therefore, of a motley variety of carbohydrate products and derivs. including di- and poly-saccharides. In fasting (before breakfast in the morning) the distribution of sugar between the corpuscles and plasma is nearly equal but under other conditions it may be quite variable. In clinical detns. of blood sugar, therefore, whole blood should be analyzed only from patients in the fasting condition. There are present in blood plasma reducing substances which disappear during hydrolysis (heating on a water bath with 1% HCl). On the other hand the sugar of the corpuscles is usually increased by hydrolysis and they probably contain polysaccharides—possibly polysaccharides other than glycogen.

A. P. LOTHPROF

Carbonic acid and bicarbonate in urine. JAMES L. GAMBLE. *J. Biol. Chem.* 51, 295-310 (1922).—The concns. of free and bound carbonic acid and the p_H were detd. in 55 samples of urine collected in such a way as to prevent, as nearly as possible, loss of CO_2 . The amt. of free H_2CO_3 in urine is nearly const. and the bicarbonate content varies inversely with the urinary p_H . As the numerator of the $H_2CO_3/BHCO_3$ (B represents a univalent atom of base) ratio is practically const. the $BHCO_3$ content of urine at a given p_H is also approx. const. The total H_2CO_3 content of urine (free and bound) falls rapidly with increase in p_H owing to the diminution of $BHCO_3$ which accompanies rise in p_H . The elimination of carbonic acid in urine is thus detd. by the CO_2 tension of blood plasma. "Maintenance in the urine of an approx. const. concn. of free H_2CO_3 greatly limits alk. shift in the reaction of urine following increase in base elimination. The reaction of urine of a p_H below 7.0 is much more a function of the $H_2CO_3/BHCO_3$ ratio than of the ratio of the phosphates. The reaction of voided urine may, therefore, rapidly increase in alkalinity because of loss of free H_2CO_3 unless collected with precaution against loss. Owing to the rapid diminution of the $BHCO_3$ content of urine with rise in p_H , urine of the usual degree of acidity contains a very small amt. of $BHCO_3$. This fact represents avoidance of a large and altogether wasteful expenditure of base."

A. P. LOTHPROF

Investigation of the glucolytic power of organs. PIERRE MAURIAU and L. SÉRYVANT. *Compt. rend. soc. biol.* 86, 552-4 (1922); cf. *C. A.* 16, 1613.—The tissues of guinea pigs, rabbits, dogs, and cattle have been studied. One g. of finely ground tissue was mixed with 4 cc. of a soln. contg. 0.5 g. Na_2HPO_4 , 1 g. $NaCl$, 1.5 g. Na citrate, and 0.5 g. glucose in 250 cc. H_2O . In a control sample the reducing power was detd. at once, the Folin and Wu method being used, while another sample was incubated for 6 hrs. at

37°, then left at room temp. for 12 hrs. (No antiseptics were employed but everything was done aseptically). The sugar detn. was repeated following the incubation, and the amt. of sugar destroyed was estd. by difference. The kidney and lung tissues were found to possess a much greater glucolytic power than does either blood or pancreas. S. M.

Formation of ammonia in the kidney. L. AMBARD AND F. SCHMID. *Compt. rend. soc. biol.* 86, 604-6(1922).—The authors offer an explanation of the mechanism of NH_3 formation in the kidney as was recently postulated by Benedict and Nash. This is based on the fact that when a dog ingests HCl there is a great increase in NH_3 excretion without any change in the alk. reserve of the blood. The HCl gives rise to NaCl of which the Na has an endogenous origin and the Cl an exogenous one. There is thus an increase in the organism of NaCl without a change in the stock of Na. This is therefore quite different from the condition when a large amt. of NaCl is ingested. The NaCl following HCl ingestion, when it reaches the threshold of the kidney, seps. into Na and Cl. The former becomes transformed successively into NaOH and NaHCO_3 . The NaOH coming in contact with urea sets free NH_3 which combines with the Cl and this is excreted as an NH_4 salt.

S. MORGULIS

The nature of the aqueous humor secondarily formed in man. W. MESTREZAT AND A. MAGITOT. *Compt. rend. soc. biol.* 86, 657-9(1922).—The authors do not accept the general view that the aqueous humor formed after withdrawal of the contents of the anterior chamber is different from the original fluid. Following puncture the humor is richer in content of albumin but with the progress of time the compn. approaches again to the normal level. The eye is, therefore, considered as admirably adapted to maintain and quickly to recuperate the physiol. compn. of the humors.

S. MORGULIS

Active and combined adrenaline. J. E. ABELOUS AND L. C. SOULA. *Compt. rend. soc. biol.* 86, 749-50(1922).—Physiol. and chem. tests fail to reveal the presence of adrenaline in the blood of the suprarenal vein only a short distance away from the gland and this A. and S. attribute to the fact that the adrenaline is inactivated. Of the 3 structural parts of adrenaline, the amine group is concerned with its vasomotor effects while the diphenol group is responsible for the color reaction. Formalin inactivates the vasomotor effect of adrenaline by hindering the amino group. Similarly, if a soln. of adrenaline is left standing with horse serum it fails to produce dilatation of the pupil of the enucleated eye though the effect can be obtained if the two have just been mixed together. Similarly when injected into a dog, serum and adrenaline freshly mixed produce mydriasis but when the two had remained in contact for an hour the injection had no effect. The tissues of the visceral organs or muscle can break up this union with the adrenaline which deprives it of its activity. When minced tissue is added to the mixt. of adrenaline and serum the adrenaline is very much less inactivated than when the mixt. is used alone, as can be shown by the effect both have on dilating the pupil of the enucleated eye. The authors therefore believe that in the body the inactivated adrenaline of the blood resumes its activity when it gets to the tissues and particularly to the sympathetic nerve endings.

S. MORGULIS

Effect produced by the injection into the lateral ventricles of the brain of extracts of hypophysis, thyroid and kidney. L. STERN, F. BATTELLI AND J. JAUFFRET. *Compt. rend. soc. biol.* 86, 753-4(1922).—The exts. were prepd. fresh from the glands treated with twice the vol. of salt soln. Expts. were made on dogs (0.6 to 1.2 cc. according to the size of the animal) and guinea pigs (0.2 cc. per animal) with the results generally agreeing for both. Ext. of the posterior lobe of the hypophysis produces at first no appreciable effect, but soon the animals become somnolent and torpid. This passes into a state of deep sleep which lasts for many hrs., then the animal gradually gets back to its normal state. In the guinea pigs the body temp. drops to 31° and a slight glucosuria de-

velops. Injections of the exts. from the anterior lobe have practically no effect. Exts. from kidney produce immediately very violent reactions (muscular contractions) which however pass over into prostration and quietude. Similar effects are produced by muscle exts. but not of such strength. Thyroid exts. give variable results, in some cases great agitation, in others no apparent effect. The body temp. likewise may either increase or drop. The initial excitation is always followed by prostration. S. MORGULIA

Effects produced by injections into the lateral brain ventricles of extracts of the pineal body, suprarenal capsule, liver, testicle and ovary. F. BATTELLI AND L. STERN. *Compt. rend. soc. biol.* 86, 755-6 (1922).—Pineal body exts. produce in some instances an immediate excitation which, however, is soon followed by calm and somnolence. The animal falls into a deep sleep as in the case of hypophyseal ext. injection, but after some time it awakens and is evidently normal. In general the body temp. tends to rise, as much as 2°, but in about 2 hrs. it returns to the normal level. Adrenal cortex injections produce an initial slight agitation in the guinea pig, slight fall in temp. and frequently death in 24 hrs. In dogs there is no immediate effect but the animals fall asleep for many hrs. then awaken again. Injections of adrenal medulla produce essentially paralysis. Guinea pigs die rapidly from arrest of respiration. With more dil. exts. the effect is less violent, and in both guinea pigs and dogs there is a lowering of temp., diminished sensibility, etc., but the animals usually recover. Liver ext. injections produce strong muscular contracture. Testicular ext. causes agitation, exaggeration of sensibility, even convulsions, but the animals soon return to the normal condition. Ovarian exts. sometimes cause excitation and at other times are without effect. In dogs frequently this causes vomiting, rise in temp., polypnea. The results of these expts. allow the classification of the glands of internal secretion into 2 groups: posterior lobe of hypophysis, pineal gland, cortical and medullary substance of adrenals, which produce a predominantly depressing effect; thyroid, liver, kidney, testes, and ovary, which produce excitation. S. MORGULIS

Presence of adrenaline in the blood following the excitation of the splanchnics is good evidence of the regulation of the secretory activity of the suprarenal glands by the nervous system. A. TOURNADE AND M. CHABROL. *Compt. rend. soc. biol.* 86, 776-8 (1922).—As the title indicates the authors show that the splanchnic nerve is to be regarded as the secretory nerve of the adrenal bodies. S. MORGULIS

Function of the colostrum. JULIAN H. LEWIS AND H. GIDEON WELLS. *J. Am. Med. Assoc.* 78, 863-5 (1922).—A review of the literature is given, and the following summary: The blood of new-born infants, and probably of all other mammals, contains little or none of the serum protein or protein fraction known as the euglobulin. This seems to be supplied chiefly by the colostrum, which differs from milk in contg. a large amt. of this protein secreted directly from the blood. The euglobulin is the only blood protein that appears in the colostrum, and it is the only protein fraction in which the new-born infants blood is deficient. Evidently the colostrum supplies this deficiency during the short period immediately after birth when proteins may be best absorbed without disintegration by digestive proteolysis. The importance of this lies in the fact that the protective antibodies of the blood are found associated with the euglobulin fraction, and that the quantity of protective antibodies found in the colostrum, the milk and the infants' blood varies directly with the euglobulin content of these fluids. Evidently the colostrum furnishes to the new-born mammal protective antibodies, which probably add much to its capacity to resist infection in early life. It is not probable that there is any equiv. substitute for human colostrum for new-born infants. L. W. R.

C—PATHOLOGY

H. GIDEON WELLS

Studies in diabetes insipidus, water balance and water intoxication. I. JAMES

F. WEIR, E. ERIC LARSON AND LEONARD G. ROWNTREE. *Arch. Internal Med.* 29, 306-30 (1922).—A study of (a) 15 cases of diabetes insipidus, (b) the effects of subcutaneous injections of ext. of posterior lobe of the pituitary in normal dogs and in dogs with denervated kidneys and (c) H_2O -intoxication produced by the administration of H_2O by mouth subsequent to the subcutaneous administration of pituitary ext. (a) There was no evidence of impairment of renal function, other than the diln. of the urine. Administration of pituitary ext., subcutaneously, and, in some cases, by rectum, markedly diminished the thirst and the vol. of urine excreted, the effect lasting from a few hrs. to 4 or 5 days. Histamine had no such effect. The administration of pituitary ext. had no effect on blood or plasma vol., or on N metabolism. There was a slight retention of Cl on the 2 days of administration. (b) The administration of pituitary ext. almost entirely prevented the appearance of H_2O -diuresis in dogs. This effect was obtained even after section of the splanchnic nerves to the kidneys. (c) In 3 expts. upon 2 patients, the usual amt. of H_2O was continued after the administration of pituitary ext. Nausea, vomiting and headache appeared. Large amts. of H_2O were given by mouth to dogs receiving pituitary ext. subcutaneously. The first symptoms noted were asthenia, restlessness, frequent attempts at urination, diarrhea and vomiting and may have been due to the pituitary ext. alone. After about 300 cc. H_2O per kg. body wt. had been given, tremor and salivation, possibly due to H_2O alone, appeared. Then the animals became very drowsy and later showed muscular twitchings and ataxia on standing and walking. Then tonic and, finally, clonic convulsions appeared. If the administration of H_2O was continued, the convulsions continued and death resulted. Otherwise, after a period of coma and somnolence, there was complete recovery. The same results were obtained in animals with denervated kidneys. The possible relation of these observations to uremic and epileptic convulsions is discussed.

I. GREENWALD

The effect on arterial hypertension of increased fluid intake. J. B. ORR AND I. INNES. *Brit. J. Exptl. Pathol.* 3, 61-71 (1922).—Both in apparently normal subjects and in pathol. cases with high arterial tension copious ingestion of water is followed by a decrease in blood pressure. It is suggested that the fall in pressure is due to the elimination of pressor substances that cause arterial constriction. When diuresis is unable to keep pace with the intake of water, as may occur in renal inefficiency, the fall in pressure is preceded by a rise above the original level.

HARRIET F. HOLMES

Anoxemia and the increased electrical excitability of the neuro-myone. N. MORRIS. *Brit. J. Exptl. Pathol.* 2, 101-116 (1922).—An increase in the elec. excitability (*e. e.*) occurs independently of change in the alk. reserve. Any exptl. method whereby an anoxemia is produced (asphyxia, diminution of alkalies or administration of cyanides and histamines) causes an increase in the *e. e.* Acids lower the *e. e.* Any increase in the *e. e.* is accompanied by a diminished supply of O to the tissues. One must therefore conclude that anoxemia is the essential condition underlying an increased *e. e.* of the neuro-myone.

HARRIET F. HOLMES

The effects of the parenteral administration of large doses of colloidal silica. W. E. GYR AND W. J. PURDY. *Brit. J. Exptl. Pathol.* 3, 75-85 (1922).—Silica sol administered parenterally is a poisonous substance. Injected intravenously in very large doses it causes immediate death, which is due to clotting of the blood. Injected in sublethal doses it accelerates the rate of clotting of the blood when shed. Added to blood *in vitro* it has no influence on the rate of clotting. Silica sol injected intravenously in rabbits in daily doses of 30 to 72 mg. causes death in 2 to 4 days, and post-mortem petechial hemorrhages and profound degeneration of liver and kidney are found. The conclusion is drawn that the primary action is on the vascular endothelium. H. F. H.

Nephropathia gravidarum. A. V. FEKETE, D. FUCHS AND B. MOLNÁR. *Wiener Arch. inn. Med.* 3, 397-424 (1922).—The nephropathies of pregnancy are of 2 distinct

types. One form is a nephrosis with edema with retention of NaCl and H₂O but without rise of blood pressure, increase in the residual N in the blood or changes in the fundus of the eye. The other form is a nephritis, with N retention, rise of blood pressure, increase of residual N in the blood and albuminuric retinitis. The first form reacts well to a restriction of H₂O and NaCl but this is of no avail in the second form and the rapid progress of the eye changes generally call for artificial interruption of the pregnancy. Eclampsia more commonly occurs with the first form. Both these forms of nephropathies of pregnancy are the work of some unknown injurious agent acting only on the vessels of the subcutaneous cellular tissues (edema without albuminuria), or on these vessels and also on the kidney (nephrosis) or only on the kidney (nephritis) or only on the vessels of the brain (eclampsia).

HARRIET F. HOLMES

Mechanism of changes in resistance of the red blood corpuscles. STEFAN RUSZYK AND IRENE BARÁT. *Wiener Arch. inn. Med.* 3, 429-32(1922).—Blood corpuscles that have withstood a partial osmotic hemolysis show a decreased resistance to other hemolytic agents. Blood corpuscles that have withstood a partial hemolysis with a hypotonic soln. of 0.36% NaCl show an increased resistance to osmotic hemolysis. After partial hemolysis with a soln. of bile salts the resistance of the surviving blood corpuscles is increased to osmotic hemolysis, but is decreased to all other hemolytic agents. After partial hemolysis with saponin and Na oleinicum the resistance of the surviving blood corpuscles is decreased. The bile salts are the only hemolytic agents found which increase the osmotic resistance of the blood corpuscles. If in certain diseases the blood shows an increased resistance and if action of the bile salts can be excluded, it may be concluded that the increased resistance is due to the presence of young corpuscles.

HARRIET F. HOLMES

Distribution of blood sugar in the circulating blood. LADISLAUS CSAKI. *Wiener Arch. inn. Med.* 3, 459-468(1922).—In estg. the distribution of sugar in the circulating blood, the micro method of Bang was used, defibrination of the blood or the introduction of substances retarding coagulation being thus avoided. The blood corpuscles in normal circulating blood are found to be almost or entirely free from sugar while the blood corpuscles of diabetics show an appreciable sugar content. The blood corpuscles of non-diabetics remain free or almost free from sugar even when the blood sugar is increased, while the blood corpuscles of diabetics are permeable for sugar even when the sugar content of the blood is low. The presence or absence of acetone bodies does not change the differences noted between the sugar content of the blood corpuscles of diabetics and non-diabetics. Normal blood, after defibrination or after the addition of substances retarding coagulation, behaved like the blood of diabetics. H. F. H.

The kidney factor in phlorhizin diabetes. THOMAS P. NASH, JR. *J. Biol. Chem.* 51, 171-81(1922).—"In phlorhizinized dogs the renal venous blood shows a lower concn. of sugar than the general arterial blood, provided the kidney function has not been abolished or seriously impaired. Failure to control the effect upon the kidney of general anesthetics and inherent errors in the methods employed for blood collection and sugar estn. account for contrary results previously reported. It appears that the kidneys, under the influence of phlorhizin, do not acquire a sp. sugar-producing function. The results confirm an increased permeability of the renal epithelium." The greatest observed loss in blood sugar in passing through the kidney was 0.04% and the av. excess of sugar in the arterial blood of the 5 positive cases was 0.022%.

A. P. LOTHEOP

Determination of urea in different sera. A. MARIE. *Compt. rend. soc. biol.* 86, 72-3(1922).—M. finds that following an infection of pneumococci, streptococci, rabies virus, tetany toxin a sharp and considerable increase in the urea content of the serum of rabbits occurs. Similar results were obtained with intravenous injections of adrenaline. This increase in urea is considered to be due to impaired permeability of the renal epithelium.

S. MORGAN

The thyroid gland and anaphylaxis. A. LANZENBERG AND L. KRPINOW. *Compt. rend. soc. biol.* **86**, 204-6(1922).—In thyroidectomized guinea pigs the normal production of anaphylactic shock by two suitably spaced injections of serum is prevented. The thyroidectomy, to be effective, must be carried out before the first sensitizing dose of protein is given. S. M.

Induced glucuronuria as a functional liver test. F. SCHMIN. *Compt. rend. soc. biol.* **86**, 612-4(1922).—S. proposes the use of menthol in place of camphor which occasionally produces unpleasant gastrointestinal disturbance beside other drawbacks connected with its use. He finds more agreement with the clinical condition of the patient by means of the menthol, but as a result of his expts. he comes to the conclusion that even this improved method fails to convey exact information with regard to the state of the liver function. S. MORGULIS

Formalin gelification of syphilitic serums. NICOLAU DE BETTENCOURT. *Compt. rend. soc. biol.* **86**, 620(1922).—An investigation of 220 serums was made to test the discovery of Gate and Papacostas that when 1 cc. of syphilitic serum is treated with a few drops of formalin a jelly forms within 24-30 hrs. at room temp. In 76 serums with a positive Wassermann reaction only 26% gave the gelification test. Of the remaining 144 serums which gave negative Wassermann reaction 95% also gave a negative formalin test, while 7 belonging to persons without any clinical or family history indication of syphilis formed a gel. The test is therefore regarded as of no particular sero-diagnostic value. S. MORGULIS

Diuresis produced by minerals. P. L. VIOLE AND L. LESCOEUR. *Compt. rend. soc. biol.* **86**, 655-7(1922).—Excessive amts. of K in the diet cause a large elimination of Na, which of course may act as a diuretic. The authors consider the possibility of utilizing this metabolic reaction in cases of hydropsies. A preliminary study of the influence of K-poor foods (rice, eggs, cream, milk) as compared to K-rich foods (potatoes, beef, chocolate, lemons, prunes) corroborate the assumption that the latter actually produce a mineral (Na) diuresis. S. MORGULIS

The increase of organically combined uric acid in human blood. MATHIEU-PIERRE WEIL AND CH. O. GUILLAUMIN. *Compt. rend. soc. biol.* **86**, 659-61(1922); cf. *C. A.* **16**, 1614.—An increase of free uric acid or rather its salts in the blood is due to a deficiency in renal function, but the increase in the organically combined uric acid is associated with general metabolic disturbances. Normally the organically combined uric acid in the red cells is somewhere between 120 and 150 mg. per kg. In fevers and other diseases involving increased N metabolism, in cardiovascular diseases, nephritis, diatheses and rheumatic affections this tends to increase very much, up to 200-300 mg., and occasionally to even higher levels. S. MORGULIS

The dissociation of the acid-pepsin secretion in certain gastric affections. M. LORPER AND J. BAUMANN. *Compt. rend. soc. biol.* **86**, 730(1922).—From a study of the pepsin and HCl content of the stomach juice following a standard test meal (pepsin std. by the degree of digestion of a standard protein soln. by 2 cc. of the juice) applied to a variety of pathol. cases the authors come to the conclusion that a complete dissociation of the 2 secretory processes occurs; high pepsin content may go with hypochlorhydria and a low pepsin with much hyperchlorhydria. The high peptic content is believed to be more responsible for nausea and pain than the HCl. S. MORGULIS

Variations in the pepsin content of the blood in stomach troubles. M. LORPER, J. BAUMANN AND R. DEBRAY. *Compt. rend. soc. biol.* **86**, 731-2(1922).—An increase in pepsin of the blood and its consequent passage into the urine may be due either to an oversecretion of this enzyme or to the fact that not all that is secreted is used up for digestion. However, the authors find in every serious case associated with nausea,

vertigo, diarrhea, hypertension, etc., a marked increase of pepsin in the circulating blood.

S. MORGULIS

The chemical nature of the precipitate obtained in the Meinicke (third modification) reaction for lues. H. LUBB. *Z. physiol. Chem.* 115, 147-54(1921).—The ppt. is a mixt. of H-rich, N-poor, P-contg. compds. which contains little cholesterol, is largely sol. in ether, and appears to consist largely of the lipoids (phosphatides) present in the ether rest ext. of horse heart used in the reaction.

R. L. STEHLÉ

H—PHARMACOLOGY

ALFRED N. RICHARDS

The effects of repeated intravenous injections of colloidal silica on rabbits. W. E. GYB AND W. J. PURDY. *Brit. J. Exptl. Pathol.* 3, 86-94(1922).—The intravenous injection of 5 mg. or more of silica sol daily in rabbits is followed by fibrosis of the liver, enlargement of the spleen, and changes in the kidney resembling interstitial nephritis. The weekly injection of 5 mg. of silica sol has but little effect on the liver and kidney, but in both organs the changes found, though small, are quite definite. It would appear that in order to cause an abundant formation of connective tissue with this dose, the injection of silica must be repeated daily. If 7 days are allowed to elapse between the administration of the doses the lesions produced by each dose heal practically completely before the next dose is given. When the weekly dose is 30 mg. a very definite fibrosis of liver and degeneration of kidney are produced in a few months. From this it may be concluded that the damage to cells caused by 30 mg. is too extensive to be healed completely in 1 week, and that a chronic pathol. condition is induced, fibrous tissue being formed in the const. attempt at repair.

HARRIET F. HOLMES

The action of histamine on the digestive juices in man. P. CARNOT, W. KOSKOWSKI AND E. LIBERT. *Compt. rend. soc. biol.* 86, 670-3(1922).—In at least one of the successful expts. the effect of histamine injection revealed itself in a simultaneous increase in the quantity of gastric juice and its acidity, also in a greater lipolytic and tryptic action of the pancreatic juice. The authors are nevertheless unwilling to conclude from this that the histamine has a direct action on the pancreas. A number of secondary symptoms were noted of the histamine administration: transitory flushing of the face, sensation of heat and malaise, headache and a marked tachycardia. In no instance were the effects either serious or grave.

S. MORGULIS

Therapeutic activity of a bismuth compound of the aromatic series. HENRI GREENET AND HENRI DROUIN. *Compt. rend.* 174, 647-8(1922).—The compd. is a phenolic deriv. but it is not more definitely described.

L. W. RIGGS

Toxicity of neoarsphenamine. MERRILL C. HART AND WILBUR B. PAYNE. *J. Am. Chem. Soc.* 44, 1150-60(1922).—The toxicity of com. samples of neoarsphenamine (A) ranges from 200 to 360 mg./kg. In detg. its toxicity, the variability of the test rats is a very important factor; in some cases 40-100 mg./kg. differences were obtained in the same test made on different animals. A method is suggested for standardizing the test rats by using as standard a 4% soln. of A with 20% as prepd. from analyzed arsphenamine (B) in such a way that all manipulative errors are eliminated. The app. and method used in prepg. this standard soln. are described in detail. The toxicity of the B. (90-130 mg./kg.) has a negligible effect on that of the A derived from it. In the condensation of B to A, the influence on the toxicity is shown of changes in solvent, diln., time, temp., introduction of the methylenesulfinate group and the S distribution. Introduction of a methylenesulfinic acid group increases the tolerated dose from 110 mg./kg. to about 320 mg./kg. (20% As). Introduction of a second group is complicated by side reactions giving a greater toxicity.

C. A. R.

Chloroform and peptic digestion. A. ASTRUC and E. RENAUD. *J. pharm. chim.* **25**, 81-7 (1922).—Pure CHCl_3 has but a very slow destructive effect upon the diastasic activity of pepsin; its vapors are without action; $\text{CHCl}_3\text{-H}_2\text{O}$ is a good solvent of pepsin, and may be used to advantage in preps. that are not to be kept too long. But $\text{CHCl}_3\text{-H}_2\text{O}$ is a poor medium of digestion *in vitro*, as it changes the phys. properties of pure H_2O , which is the best medium. S. WALDBOTT

Can the constancy of radiation of tubes, etc., of radium be relied upon? (NOGÈRE) 3.

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SIMPSON, F. E.: Radium Therapy. St. Louis: C. V. Mosby Co., 508 N. Grand Ave. 420 pp. \$7.00.

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I—ZOOLOGY

R. A. GORTNER

Conditions influencing the life history of the frog. A. T. CAMERON. *Trans. Roy. Soc. Canada*, **15**, Sect. V, 13-21 (1921).—*R. pipiens* freezes at $-0.44^\circ \pm 0.02^\circ$, similar to soln. isotonic with the body fluid. The temp. extremes for which life can persist are from -1.25° to 18° . These frogs can survive complete immersion for many months, though in hard waters they usually die, after 2 to 4 weeks, from distension due to retention of H_2O and N_2 . An upset of osmotic regulation leading to edema can be produced by immersion in H_2O above 16° , or in which there is an O deficiency.

A. T. CAMERON

Pentose compounds in tissues of marine animals. C. BERKELEY. *Trans. Roy. Soc. Canada* **15**, Sect. V, 41-7 (1921).—Various tissues of 3 species of elasmobranchs, and 3 of teleosts have been examined for pentose. The pancreas could only be examined in elasmobranchs. It contained relatively most pentose (2.28% calcd. as xylose, in the dog-fish *Squalus sucklii*) in agreement with results for mammalian tissue, and suggesting a connection between the pentose nucleotides and the physiological function of the pancreas. Teleost tissue is richer in pentose than the corresponding elasmobranch tissue. Those organs richest in nuclei do not contain most pentose. Similar amts. of pentose were found in molluscan and echinoderm tissue.

A. T. CAMERON

An investigation of the influence of some chemicals on the ciliary movement in the Anodonta gill. E. SARGERDAHL. *Skand. Arch. physiol.* **42**, 77-80 (1922).—Glucose, NaCl, chloral hydrate, amylene hydrate and chloratum cocaicum solns. of various concns. retard ciliary movement of the *Anodonta* gill.

F. S. HAMMETT

Action of certain substances on oxygen consumption. V. Action of potassium cyanide in relation to respiratory rate. A. E. GALIGHER. *Am. J. Physiol.* **58**, 301-7 (1921).—KCN (0.0002 M) decreases the rate of respiration in *Nereis virens*, the reduction being greatest in regions of the body in which respiration normally proceeds at a high rate. The result of this differential action is the partial or total obliteration of the gradient in respiratory rate which has been found to be characteristic of the major axis of this form.

J. F. LYMAN

Influence of temperature on the excretion of the hibernating frog, *Rana virescens* Kahn. H. C. VAN DER HEYDE. *Biol. Bull. Marine Biol. Lab.* **41**, 249-55 (1921).—The frogs were placed in an aquarium with distd. H_2O on the bottom and the aquarium was placed in a larger H_2O container in which the temp. could be controlled and the H_2O

kept constantly in motion. After 24 hrs. the urine was centrifuged to remove the skin particles and feces, and then analyzed. The temps. used were 1°, 11°, 21°, and 31°; total N. in mg. corresponding to these temps., 6.55, 10.45, 16.3, 59.03; urea and NH₃ nitrogen, 6.5, 9.2, 14.6, 50.8; NH₃ nitrogen, 1.6, 2.8, 3.5, 22.7; uric acid N, 0.0, 0.04, 0.10, 0.28. At an av. temp. below 10° the urine was water clear, at 21° moderately yellow, and at 31° deep yellow.

L. W. RIGGS

Explosion of the spermatozoa of the crab *Lophopanopeus bellus* (Stimpson). NATHAN FASTEN. *Biol. Bull. Marine Biol. Lab.* 41, 288-97(1921).—Living spermatozoa were studied in crab's body fluid, sea H₂O, distd. H₂O, ovarian fluid, sea H₂O slightly acidulated with many different acids, M/1 cane sugar, very dil. KOH, M/2 NaCl, M/2 NaNO₃, M/2 KCl, M/2 KNO₃, 3M/8 CaCl₂ and various dilns. of the last 5 salts. In sea H₂O and isotonic solns. of various salts, no change occurs in the normal appearance of the spermatozoa. In hypotonic solns. of these salts the spermatozoa explode by an eversion of the 2 vesicles and the central body. In ovarian fluids some of the spermatozoa explode violently, with a rupture and disintegration of one or both vesicles. Acidulated sea H₂O has a harmful effect on the spermatozoa, either causing swelling or shrinkage, with subsequent disintegration. A lowering of the osmotic pressure in the medium that surrounds the spermatozoa undoubtedly brings about their explosion.

L. W. RIGGS

Effect of iodine and iodothyron in the larvae of salamanders. II. Relation between metamorphosis and limb development in salamander larvae. E. UHLÉNTHUTH. *Biol. Bull. Marine Biol. Lab.* 41, 307-17(1921); cf. C. A. 13, 878, 1093, 1905; 16, 1466, 1623.—Tadpoles of *Rana sylvatica* were kept in iodothyron and in solns. of inorg. iodine. Both substances were found to accelerate limb development. Embryos as well as larvae, in early stages of *Ambystoma maculatum*, were kept in iodothyron and in inorg. I. Neither of these substances accelerated the development of the limbs, although iodothyron caused rapid metamorphosis of the salamander larvae. III. Role of the iodine in the specific action of the thyroid hormone as tested in the metamorphosis of the axolotl larvae. *Ibid.* 42, 43-52(1922).—Iodothyron and inorg. I in known quantities were administered to so-called axolotl larvae of the salamander, *Ambystoma tigrinum*. Iodothyron solns. containing only 0.03 mg. I per 1000 cc. H₂O caused metamorphosis 13 days after its first administration. Inorg. I in amts. 33 to 86 times larger and feeding still larger doses directly by mouth did not cause metamorphosis. The amphibian metamorphosis is truly the expression of the thyroid activity and not the result of the effect of inorg. I. Inorg. I as such is not the active principle of the thyroid hormone.

L. W. RIGGS

Effects of carbon dioxide on the consistency of protoplasm. M. H. JACOBS. *Biol. Bull. Marine Biol. Lab.* 42, 14-9(1922).—Expts. were made with *Paramecium*, *Colpidium*, *Ameba*, eggs of *Arbacia*, and filaments of *Spirogyra*. A short exposure of various cells to CO₂ causes a decrease, and a longer exposure, an increase in the viscosity of the protoplasm. Both of these effects are reversible, though the second one tends to pass into an irreversible coagulation if the exposure is sufficiently continued. The local application of CO₂ to *Ameba* can influence in a striking way the formation of pseudopoda. It is suggested that CO₂ may be an important factor in producing many of the natural changes in protoplasmic consistency which have hitherto been unexplained.

L. W. R.

Vital limit of exsiccation of certain animals. F. G. HALL. *Biol. Bull. Marine Biol. Lab.* 42, 31-50(1922).—Expts. were made with *Allolobophora chlorotica*, *Placobdella parasitica*, *Tenebrio molitor*, *Rana pipiens*, *Ambystoma punctatum*, *Chrysomys marginata*, *Anolis carolinensis*, *Phrynosoma cornutum*, *Sceloporus spinosus*, *Peromyscus leucopus noveboracensis*, *Microtus pennsylvanicus* and *Mus musculus*. Animals in general are very susceptible to loss of H₂O in atms. of low relative humidity but may lose a very large percentage of the H₂O contained in their bodies without loss of vitality. The amt.

of H_2O that can be lost by animals without fatal results is in general greater in the less complex animals. The length of time that animals can endure atms. of low relative humidity in general depends primarily upon the kind of integument and secondarily upon the proportion of body surface to body mass. Metabolism of an organism is an important factor in its resistance to exsiccation. In the animals tested the water exsiccated, calcd. as a % of body wt., ranged from 70.3 in the leech to 24.2 in the house mouse.

L. W. RIGGS

Hemoglobin in *Thyone briareus* Lesneur. HANS C. VAN DER HEYDE. *Biol. Bull. Marine Biol. Lab.* **42**, 95-8(1922).—Hemoglobin was found bound to corpuscles, in the Polian vesicle, the ampullae, and the wall of the water lungs of *Thyone briareus*, a dendrochirote Holothurian, common around Woods Hole. *Thyone* is a mud-dweller.

L. W. RIGGS

Phenomena of auto-destruction and of auto-agglutination in *Convolvata*. MMR. ANNA DRZWINA AND GEORGES BOHN. *Compt. rend.* **174**, 330-2(1922).—A stock soln. containing 74.8 g. of KCl made up to one liter with sea water was prepd. and dild. to $1/20$. To 2 cc. portions of this dilm. were added, (a) 20 *Convolvata* and (b) several hundred *Convolvata*, resp. In a usually in 1 or 2 min. cytolysis and ruptures began but rarely involved the entire animal. The head after the sepn. of the cytolized part lived and moved for 24 hrs. or more. In b the action though more intense had a different course. As soon as the first individuals were broken and cytolized, which was often almost instantaneously, they agglomerated and acted upon the others as a center of agglutination. As the organisms approached these centers of agglutination they were snapped up and after some contortions died, often without cytolysis. In these expts. the cytolizing and agglutinating actions appear as functions of the mass of individuals and the mass of the surrounding liquid.

L. W. RIGGS

12—FOODS

W. D. BIGELOW[¶] AND A. E. STEVENSON

Establishing a laboratory in a food products plant. FREDERIC DANNERTH. *Spice Mill* **45**, 424, 426, 606, 608, 604, 666, 691(1922).—A plan of organization is outlined. A summary is given of research reported in 1921 on coffee, tea, spices, flavoring exts., and cocoa.

C. W. TRIGG

Analyses of some African fruits. THOS. STEEL. *Proc. Linnean Soc. N. S. Wales* **46**, Part 4; *Chem. News* **124**, 184-7(1922).—Fruits examd. include: *Eupomatia laurina*, *Ficus macrophylla*, *F. rubiginosa*, the edible fig, and *Podocarpus elata*. None contains cane sugar. A table shows the following extremes in compn.: dextrose, 0.30-6.77%; levulose, 1.70-5.69; seeds, fiber, pectose, etc., 3.34-40.65%; ash, 0.41-2.30%; water, 55.0-86.5%. The diffusion method is applied. After quartering lengthwise, one section from each stalk is cut in short lengths, pulped and is then ready for analysis. The sample is quickly weighed and put in a tared flask with a return condenser. The flask is immersed in boiling water for 1 hr. with shaking at intervals. The flask is then cooled and weighed. The amt. of added water is thus detd. The liquid is strained and assayed. The percentages of fiber and water and the sp. gr. of the diffusion liquor having been detd. the total wt. of liquid derived from the added water is readily found. Direct detn. in fruits of matter insol. in water is not always practicable owing to the glutinous nature of the pulp and the imperfect soly. of the pectin substances. This necessitates obtaining the total of these by difference. Some results are given on *Finian wild sugar cane*, roots of the dragon tree, deposits of $CaCO_3$ in timber of *Geissor's Benthams*, detn. of the N content of fungi and examn. of the exudation from *Myoporum Platycarpum*.

W. H. BOYNTON

Determination of "strength" or neutralizing power of acid calcium phosphates. W. E. WADMAN. *J. Ind. Eng. Chem.* 13, 1146-8(1921).—Since the real purpose of such a test is to det. how much NaHCO_3 can be neutralized, and its CO_2 liberated, by a given amt. of $\text{Ca}(\text{H}_2\text{PO}_4)_2$, when used in leavening breadstuffs, the test should be conducted under conditions as nearly as possible like those which prevail in actual baking practice. These conditions are more nearly met by direct titration with standard alkali of about 0.5 *N* strength with about 30 cc. of H_2O per g. of phosphate and a liberal amt. of phenolphthalein. G. W. STRATTON

Sulfurous acid in preserved cider. LINDER. *Compt. rend. agr. France* 8, 325-30 (1922).—If one wishes to keep cider sweet for a year or more by the use of SO_2 it is necessary to use only sound apples, free from fungi. F. M. SCHERTZ

Report on the composition and dietetic value of "trufood" (full cream). ANON. *J. State Med.* 30, 177-81(1922).—The milk is delivered at the factory within 2 hrs. of milking and subjected to the fermenting and reductase test. It is run through a separator to remove foreign matter, passed into a pasteurizer and raised to 70° . From there it flows into A1 tanks where it remains for 30 min. at $65-70^\circ$. It is drawn through a closed pipe-line into a condenser where $\frac{2}{3}$ of the H_2O is removed under a vacuum of 24 in. at 60° . The condensed milk is drawn through closed pipes to the 3-stroke high pressure plunger pumps and meets, as an extremely fine spray, the current of warm dry air which converts it instantaneously into fine white powder. Chem. analysis shows 1.14% H_2O , 29.24% fat, 23.14% casein, 3.21% lactalbumin, 37.34% milk sugar, and 5.93% mineral matter. It dissolves readily in cold H_2O and gives rise to no deposit or surface solid particles. Its color is more analogous to ordinary cow milk than other dry powders and it is susceptible to the action of rennet and it is coagulable to heat. Bacteriol. examn. showed the number of organisms to be below the standard for certified milk. DOROTHY B. SCOTT

The use of domestic methylene blue in staining milk by the Breed method. W. A. WALL AND A. H. ROBERTSON. *J. Bact.* 7, 307-8(1922).—Sols. of methylene blue in 30% alc. are more satisfactory than aq. sols. Hence the alc.-insol. Zn salt should not be used. JOHN T. MEYERS

German legislation concerning artificial sweetening agents. ANON. *Chem.-Ztg.* 46, 361-3(1922).—Under the laws of 1898 and 1902 saccharin and similar substances were discriminated against, and their manuf. and sale made unprofitable. Saccharin was treated almost like a poison; when used in foodstuffs it was legally an adulterant. War conditions caused the government to consider saccharin, dulcin, etc., as aids in a time of need, and the enforcement of the law was suspended. Dulcin became an active competitor of saccharin. In 1917-19 about 1000 tons of artificial sweetening agents replaced some 300,000 tons of sugar. No injurious effects on health were ever traced to their use. The new law ignores these facts, however; it has taken over almost all the repressive measures of the old law. Arguments are offered against the law.

W. C. EBAUGH

New way to roast coffee. C. W. TRIGG. *Tea Coffee Trade J.* 42, 629-30(1922).—Process of Trihes (*C. A.* 16, 976) does not lend itself to American practice.

C. W. TRIGG

The vacuum-packing of coffee. W. W. WILLISON. *Tea Coffee Trade J.* 42, 607-8(1922).—Roasted coffee keeps better when "vacuum-packed" because of reduced oxidation.

C. W. TRIGG

New coffee-packing process. DWIGHT TENNEY. *Tea Coffee Trade J.* 42, 609-13 (1922).—Packing roasted coffee in an atm. of CO_2 maintains the quality by eliminating oxidation. Lighter tin-plate may be used for cans than when "vacuum-packed."

C. W. TRIGG

The vanilla pod. I. V. S. STANISLAUS. *Tea Coffee Trade J.* 42, 528, 530, 532, 674, 676, 678 (1922).—A discussion of cultivation, curing, sophistication, and preservation of vanilla.
C. W. TUGO

The production of pink sauerkraut by yeasts. E. B. FRED AND W. H. PETERSON. *J. Bact.* 7, 257-69 (1922).—The pink or red color of sauerkraut is due to the growth of certain yeasts or torulae. The chief factors in the production of pigment are a temp. above 20°, the presence of 3% or more of NaCl, or a high acidity. High-acid-producing bacteria as well as the addition of acids to the cabbage favor pigment formation.

JOHN T. MEYERS

Canned salmon. RAY W. CLOUGH. Natl. Cannery Assoc. Pacific Fisheries Investigations. *Report of chemist* 1921.—The fat content of different cuts of 5 species of salmon differs greatly. Near the gills including the belly and back on 2 king salmon it was 20.15 and 15.10% and near the tail on the same fish it was 11.11 and 8.10%. Protein is practically the same on all species; oil varies greatly. The amt. of free oil and free liquor increases in canned salmon on storage. A peculiar liver-like substance usually formed in canned salmon was coagulated, extd. protein and is found in fish canned when fresh or tainted. Exhausting did not appear to affect the indole content of stale or tainted fish. Decompn. in salmon may often take place without production of skatole and indole. Out of 488 strains of bacteria taken from salmon 99 produced indole and skatole when grown on salmon. No details are reported. Cf. C. A. 15, 1360.
H. A. LEPPER

The limits of the agglutination test for ricin. HAROLD WAITES. *J. Soc. Chem. Ind.* 41, 113-4T (1922).—The test depending on the agglutination of red corpuscles of blood was found to be sensitive for 1 : 2000. By subcutaneous injection with guinea pigs 1 part to more than 40,000 could be detected.
H. A. LEPPER

Milling quality of Saskatchewan wheat. MANLEY CHAMPLIN AND CYRIL H. GOULDON. *Sci. Agr.* 2, 283-92 (1922).—Tables show the results from 1913-20 of milling and baking tests on the same varieties of wheat, the influence of the time of cutting and of seeding, the difference in the strains of one variety, and the variations in the milling and baking tests of the same wheat from different points in the province.

DOROTHY B. SCOTT

Investigation of the fodder value of straw hydrolyzed by different methods. II. Hydrolysis of straw with caustic lime with and without pressure. F. HONCAMP AND F. BAUMANN. *Landw. Vers. Sta.* 98, 1-41 (1921); cf. C. A. 14, 435.—In the hydrolysis of straw with $\text{Ca}(\text{OH})_2$ as in the case of NaOH there is a loss in org. substances which is greater when the hydrolysis takes place under pressure than by simply boiling. The lignin content of a hydrolyzed straw does not serve as a measure of the degree of hydrolysis. Hydrolysis with $\text{Ca}(\text{OH})_2$ makes a product whose starch value is above that of the original straw. It increases the fodder value approx. the same as does NaOH. The moist $\text{Ca}(\text{OH})_2$ straw was eaten at once and the dry less willingly. The lignin of straw was found to be wholly indigestible. III. Hydrolysis of straw with sodium carbonate. *Ibid* 43-63.—The effect of hydrolysis with Na_2CO_3 is very similar to that with NaOH and $\text{Ca}(\text{OH})_2$. Cellulose is not attacked at all while pentosans are. By cooking the straw with a Na_2CO_3 soln. of the same concn. as that used with NaOH and $\text{Ca}(\text{OH})_2$, the fodder value of the straw is considerably improved. IV. Hydrolysis of straw with caustic lime under pressure. F. HONCAMP, O. NOLTE AND E. POMMER. *Ibid* 249-363.—Only cereal straw is suitable for hydrolysis with $\text{Ca}(\text{OH})_2$ under pressure. The legumes are wholly unfit for use while the crucifers are little bettered by the process. Hydrolysis with 3.5 kg. of $\text{Ca}(\text{OH})_2$ per 100 kg. of straw gave approx. as good results as twice the amt. of NaOH. In the hydrolysis of straw one must be contented in obtaining a product whose org. substance, relative to its digestibility, compares somewhat with that of a

good meadow hay. The greater the maceration of the straw and the more the straw loses its coarse fodder character, the less willingly it is eaten by animals. This was true for hydrolyzed straw which was subsequently artificially dried. The soln. of silicic acid in hydrolyzed straw is not very uniform. The advantage of straw hydrolysis probably lies in the fact that the cellulose is broken apart so that bacteria may more readily attack it. The digestible part of the pulp has the compn. of pure cellulose.

F. M. SCHERTZ

The hydrolysis of straw with caustic soda and caustic lime at ordinary temperature. O. NORRÅ. *Landw. Vers. Sta.* 98, 129-34 (1921).—It is not the OH ion alone which hydrolyzes the straw; the cation plays an important role, perhaps by the formation of difficultly sol. compds. which hinder the further hydrolysis of the materials. The hydrolysis with CaO and NaCl and with CaO and NaOH ought to be more favorable than a corresponding hydrolysis with CaO alone.

F. M. SCHERTZ

Maize cake, its composition and fodder value. E. POMMER. *Landw. Vers. Sta.* 98, 243-8 (1921).—The dry material contained 9.04% of digestible protein and 69.8% of starch.

F. M. SCHERTZ

The composition and the digestibility of some foreign fodder peas. F. HONCAMP AND K. MONTAG. *Landw. Vers. Sta.* 99, 41-51 (1921).—Indian "mollorpeas" were reputed to contain a poison, a volatile alkaloid, but the authors could not confirm this. Any harmful action of the peas would be lost on cooking.

F. M. SCHERTZ

Sulfur and nitrogen content of alfalfa grown under various conditions. E. H. HALL. *Bot. Gaz.* 73, 401-11 (1922).—Hay from fields with the heaviest crops contains the highest percentage of S. The N content is not emphasized.

B. H.

Molasses for feeding purposes. H. C. S. DE WHALLEY. *J. Soc. Chem. Ind.* 41, 169-70R (1922).—Comparison of beet and cane molasses is made. A distinct difference in the compn. and value of the two is shown. The latter is preferable for feeding as the cane has an appetizing smell and taste, a low content of alkali salts and a high content of total carbohydrates. The sole advantage in favor of beet molasses is its higher content of nitrogenous matter but since this is mainly amides and some nitrate the advantage is negligible. These remarks do not apply to combinations of peat-moss and beet molasses.

LILLIAN OFFUTT

Determination of the alkaloid content of lupines (MACH, LEDERLE) 11E. Comparative antiscorbutic values of milk (JOHNSON, HOOPER) 11E. Nutritive value of edible oils and fats (DRUMMOND, ZILVA) 11E. Apparatus for the determination of the albumins of milk (MEILLÈRE, SAINT-RAT) 1.

HAYDUCK, F., BINZ, A. and NEUMANN, B.: *Ergänzungswerk zu Muspratts Enzyklopädischem Handbuch der Technischen Chemie*. 4 Band: Chemische Technologie der Gährungsgewerbe, Nahrungs- und Genussmittel. 2 Halbband. Braunschweig: F. Vieweg & Son. M 192, bound 230 + 30% Tax.

Milk fat. J. C. BAKER. U. S. 1,413,092, Apr. 18. Cream is sepd. from whole milk, agitated and heated to melt the fat and the oil is sepd. from the "butter-milk" and the latter readmixed with the milk. The sepd. fat is further purified.

Milk pasteurizer. I. R. HIPPEMEYER and C. SKIDD. U. S. 1,412,115, Apr. 11.

Ice cream. A. S. SANNA. U. S. 1,414,214, Apr. 25. Milk is prepd. for making ice cream by collecting the casein, other albuminoids and fats into a substantially homogeneous mass, and coagulating it to a concd. product which is then frozen. U. S. 1,414,214 relates to mech. clarification of ice cream mixts.

Ice cream. A. R. SANNA. U. S. 1,414,213, Apr. 25. Milk is heated to 100° or somewhat lower to condition the albuminoids other than the casein and to bring the casein together and destroy its fibers and after lowering the temp. an enzyme is added to effect coagulation. The coagulate is broken up and a portion of the whey removed preparatory to use in ice cream mixts.

"Butter substitute" for cooking. J. STARRELS. U. S. 1,414,675, May 2. A mixt. of the approx. consistency and color of butter is formed of hydrogenated oil and a natural oil such as peanut oil, cottonseed oil, soy bean oil or corn oil.

Cereal and fruit beverage. C. ELLIS. U. S. 1,414,557, May 2. A "coffee substitute" is prepd. by roasting barley or similar cereal material to a temp. which somewhat darkens its color and mixing it with fruits such as raisins, figs, dates or prunes which have been roasted at a lower temp. to avoid caramelization.

Caffeine from coffee. H. ROSBLIUS. U. S. 1,414,096, Apr. 25. Raw coffee beans are heated to about 100–140° and a solvent such as benzene is then applied and the extd. coffee is reheated and then treated with steam.

Drying fruit or other food products. B. S. HARRISON. U. S. 1,414,275, Apr. 25. Drying is effected in thin layers in an open field and singeing with a flame or hot blast is resorted to to destroy mold spores.

Food (dry water-soluble extract of oats). H. MOCK. U. S. 1,414,576, May 2.

Dry meat extract. A. CHALAS. U. S. 1,414,177, Apr. 25. Juice or liquid plasma pressed from meat fibrin is evapd., at low temp., in a high vacuum after cooling to a temp. only slightly above the f. p.

Apparatus for smoking and curing meat. T. G. CRANE. U. S. 1,414,504, May 2. **Vanillin.** SOC. CHIMIQUE DES USINES DU RHÔNE. Brit. 175,589, May 21, 1921. Vanillin is mixed with starch or other innocuous material which swells in H₂O and the mixt. is compressed into tablets to be used for flavoring purposes in cookery.

Cacao preparations. P. L. BUFFA. Brit. 175,740, Nov. 18, 1920. To produce a chocolate-like prepn. which will keep soft and moist while only contg. a small amt. of fat, cacao beans, which have been roasted, husked, deprived of all but 20% of fat, and ground, are cooked at 50° in a water-jacketed vessel along with a non-crystg. sugar, prepn., such as a mixt. of sugar with glucose, cream of tartar, citric acid, or acetic acid; a gelatinous substance, such as agar-agar, isinglass, or other animal or vegetable gelatin; and a substance such as glycerol, petroleum jelly or cacao butter which does not evap. and maintains the product in a soft state. Foodstuffs, medicines, flavors, scents, etc., may be added.

Bleaching gelatin. I. HOCHSTADTER. U. S. 1,412,523, Apr. 11. Gelatin or other foods are bleached by successive treatment with SO₂, H₂O₂ and NH₃ soln.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

The use of basalt in chemical industries. LÉON DRIN. *Chimie et industrie* 7, 622–3(1922); cf. Dhé, *C. A.* 14, 3303. A. P.-C.

The business side of chemical manufacturing. CHAS. WADSWORTH, 3d. *Chem. Met. Eng.* 26, 920–2, 967–71, 1064–8(1922); cf. *C. A.* 16, 1626. E. J. C.

Precaution in emptying a double-tube counter-flow condenser. *Wärme u. Kälte Technik* 24, 82(1922).—The evapn. produced by removing the NH₃ to make repairs caused the cooling H₂O to freeze. Damage was narrowly averted. E. T. W.

Cutting fluids. E. C. BINGHAM. U. S. Bur. of Standards, *Tech. Papers* 16, No. 204, 35-77 (1922).—Cutting fluids are used both to cool and to lubricate. When lubrication is important it is generally recognized that fatty oils are superior to mineral oils. The evidence appears to prove that the fixed oils owe their superiority not to differences in viscosity or surface tension but to residual valence or acidity which causes them to adhere more firmly to the metal than do the mineral oils. Various methods are suggested for the qual. and quant. measure of *adhesion*. In Part II the fluidities, and surface tensions and sp. gravities of *linseed oil*, *cottonseed oil*, *lard oil*, and a naphthene-base *mineral oil* are given, as measured by A. W. C. Menzies, and W. G. Kleinspehn. Expts. by G. Q. Lewis are recorded which show that mineral oils may have substances added to them which will for certain purposes make them superior to lard oil; and perhaps for many purposes the addn. of fatty acids, pine oil, or S derivs. to mineral oils will make it possible to obviate the use of the expensive fixed oils. In Part III the classes and formulas of cutting oils are discussed together with their uses in various operation.

EUGENE C. BINGHAM

The separation of volatile substances from gases. II. The applicability of cresols. E. BIRL and W. SCHWEBEL. *Z. angew. Chem.* 35, 189-92 (1922); cf. *C. A.* 16, 450.—Measurements of the partial pressures of solns. of $(C_2H_5)_2O$, alc., $(CH_3)_2CO$, C_6H_6 , and CCl_4 in cresol and anisole indicated that complex compds. of $(C_2H_5)_2O$, alc., and $(CH_3)_2CO$ were formed with cresol, resulting in a diminution of the vapor tension of the volatile substance. No such compds. were formed with anisole. C_6H_6 and CCl_4 formed no complexes with either cresol or anisole. For these reasons cresol is particularly valuable as an absorptive medium for gases contg. high concns. of $(C_2H_5)_2O$, alc., or $(CH_3)_2CO$. Cresol and paraffin oil have about the same value as absorbents for C_6H_6 and CCl_4 , although activated charcoal is superior to either. For low concns. of volatile substances activated charcoal is far superior to cresol. The complete vapor pressure data are given.

T. S. CARSWELL

An explanatory note on heat insulating materials. MAX JAKOB. *Arch. Warmewirtschaft* 3, 23-6 (1922).—An explanatory discussion of an article by Hencky and Cammerer, *Mitt. Forschungsheim für Wärmeschutz*, Nos. 1 and 2. Contrary to H. and C. the only comparable method of expressing value of an insulating material is its heat transmission coeff. Tables are given showing that the fall in temp. or the total amt. of heat lost per hour depends on so many variables that they cannot be used as a comparison of insulating materials. The paper contains a number of references to articles on heat-insulating materials.

W. L. BAUGER

Lubricants and substitutes for them. BRUNO SIMMERBACH. *Wärme u. Kälte Technik* 24, 53-6 (1922).—A review of the problem of substitutes for petroleum and animal lubricants, with references to the German patent literature. E. W. THIEL

Boundary lubrication. The paraffin series. W. B. HARDY and I. A. DOUBLEDAY. *Proc. Roy. Soc. (London)* 100A, 550-75 (1922).—The authors investigate the lubricating properties of normal paraffins and their related acids and alcs. on glass and steel. The method was that already described (*C. A.* 14, 3552), using a slider with spherical surface sliding on a plane, but with improved technic. A "clean surface" is a perfectly definite and reproducible thing, but it is not necessarily the same as a surface obtained by fracture. A clean glass plate gives a coeff. friction of 0.94; a steel plate gives 0.74. Coulomb's (or better Amonton's) law of sliding friction is not an approximation as supposed, but an exact law, so long as the solid surfaces and lubricant remain unchanged. When a drop of lubricant which has a sensible vapor pressure is placed anywhere on a clean plate, nothing visible happens, but there is a primary film formed which lowers the friction. This primary spreading is slow, lasting an hour or more. After this primary film is formed more lubricant up to a flooded condition does not

affect the friction. The crit. value is, therefore, that amt. which is in equil. with satd. vapor. In passing air contg. EtOH vapor over app. made of steel or glass a definite concn. is required before the static friction falls at all. The friction first falls rapidly and then less rapidly and in a linear manner, similar for glass and steel. The static friction μ of the hydrocarbons and alcs. when plotted against their mol. wt. M gives a perfectly linear curve $\mu = b - a$, becoming zero as the mol. wt. increases. In the acid series, HCOOH and AcOH are exceptional in that they are not on the curve given by the higher acids. A solid lubricant is not removed by polishing. The effect of substituting steel or Bi for glass is to move the curve parallel to itself, i. e., to change the parameter a . The value of the coeff. of friction is in the order glass > steel > Bi. When the slider is of glass and the plate of steel the coeff. of friction is exactly midway between that of glass on glass and steel on steel. In the theoretical discussion the authors state that the lubricant in the primary film has lost its fluidity, owing to the attraction of the solid. Since the friction with primary film or flooded surface is the same, the film must be identical in both cases. The authors believe that the slip is confined to one plane but in some way the field of attraction makes itself felt at the plane of slip. The mols. of lubricant may be in a subcrystalline condition near the solid surfaces.

EUGENE C. BINGHAM

FISCHER, LUDWIG: *Betriebserfindungen*. 2nd Ed. Berlin: Carl Heymanns. 59 pp. M 8.

SCHÜLE, W.: *Technische Thermodynamik*. Band I: Die für den Maschinenbau wichtigsten Lehren nebst technischen Anwendungen. 4th Ed. revized. Berlin: Julius Springer. 560 pp. M 105, bound. Reviewed in *Z. Ver. deut. Ing.* 65, 1251 (1921).

STILLMAN, THOMAS B.: *Engineering Chemistry*. 5th Ed. revized. Raston, Pa. Chemical Publishing Co. 760 pp. \$6.

Adsorption processes. SILICA GEL CORPORATION. Brit. 175,987, Feb. 22, 1922. Consists in adsorbing a solute from a non-aq. soln. by means of a porous material having pores of a suitable size. The substance absorbed may be afterwards liberated in any manner, as by passing air over the material, subjecting it to reduced pressure, or by heating it. A suitable porous material is defined as a substance which will absorb not less than 10% of its initial wt. of H₂O at 30° and a partial pressure not exceeding 22 mm. of Hg. In a polyphase system the component most adsorbed is that which exhibits the smallest surface tension towards the adsorbing material. The extent of the adsorption is also influenced by the difference in d. between the components, the smaller this difference the greater the adsorption of one of the components. As examples, HOAc is adsorbed by silica gel from a soln. in benzene, and butyric acid from a soln. in gasoline.

Treating gases with liquids. H. EGBELING. Brit. 175,649, Feb. 17, 1922. A saturator, for use more particularly in the manuf. of (NH₄)₂SO₄, is constructed so that the passage of gas through the liquid is mainly horizontal. The saturator is fitted with a bell beneath the upper edge of which are the gas inlets. The lower edge of the bell is serrated, and extends for a short distance only below the level of the liquid in the saturator. The bell is fitted with a disk by means of which the gas is made to traverse a radial path until it escapes through the aperture. The edge of the bell is kept free from salt incrustations by means of a sprinkler tube, the liquor from which flows through the apertures, being kept at const. level by the overflow. The gas finally leaves through the outlet and the salt is discharged through a siphon. A suitable construction is specified.

Filtering organic liquids. B. W. COLLINS. U. S. 1,413,457, Apr. 18. Silicic acid is used as a filtering medium for sepg. solid particles from solns. such as TNT in C_2H_4 or other org. solvents immiscible with H_2O .

Distilling oils or other liquids. H. A. HILLS. U. S. 1,414,465, May 2. A still is used having an inclined bottom against which a part of the liquid is forced horizontally during the distn. to set up a circulation which aids vaporization and restricts foaming.

Centrifugal separation of emulsified substances. J. B. HELLER. U. S. 1,412,738, Apr. 11.

Filling high-pressure vessels with liquefiable gases. P. HEVLANDT. U. S. 1,414,359, May 2. The gas while liquefied is introduced into the pressure vessel which is contained within an inner receptacle of low sp. heat capacity.

Lubricant for friction bands. D. M. SORENSON. U. S. 1,414,237, Apr. 25. A neutral oil such as petroleum lubricating oil is mixed with an ammonia soap. U. S. 1,414,311 relates to the use of such compns. on bands of planetary transmissions.

Insulating plate. KUMPEI NII. Jap. 39,010, June 23, 1921. The stem of *Pectasites japonicus* is heated with about 1% NaOH soln. in a closed vessel and piled for 2-3 days at 25-35° for complete fermentation. It is then beat, mixed with 0.5% alc., 0.3% formalin, 0.6% naphthalene, 1% extractum rhei, and 1% $Al_2(SO_4)_3$ and pressed to a plate of suitable size.

Insulator of mica. MASAICHI MIURA and RIKITA KUWAHARA. Jap. 38,983, June 22, 1921. Mica sheets are pasted together with a mixt. of 200 g. copal, 100 g. casein, 300 g. H_2O , 50 g. 10% NH_4OH , and 10 g. formalin, heated to 110°, and pressed with pressure of 1,000 lbs.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

The analysis of water. F. TOUPLAIN. *Chimie et industrie* 7, 634-9(1922).—The Institut d'Hydrologie et de Climatologie proposes making a complete survey of all French waters (rivers, lakes, springs, wells, coast, etc.), the data accumulated being of such a nature that the origin of a given sample can be readily and quickly identified and any subsequent manipulation detected. The scheme of analysis recommended for the identification of samples of unknown origin comprises detns. of cond., f. p., refractive index, ionization, residue to 180°, sulfated residue, Cl, Br, I, As, S (in its various forms). The importance of these methods, and more particularly of the physical methods is discussed. A portable app. for the cond. detn. is described. A. P.-C.

The determination of hardness in industrial waters. G. WEISSENBERGER. *Z. angew. Chem.* 35, 177-9(1922).—Of the 3 rapid methods for the detn. of hardness exptl. results on waters of varying compn. and degrees of hardness show that the modified soap method is to be preferred to the K oleate method of Winkler or the Blacher K palmitate method. The Winkler method, while applicable in waters of low salt concn., is advised against because of its general inconsistency. Blacher's method is fairly accurate in medium hard and hard waters, giving good results in a chemically softened water. The modified soap method gives accurate consistent results in all the classes of waters examd. and is therefore to be recommended. MARTIN E. FLENTJE

Water softening for industrial and other purposes. J. P. O'CALLAGHAN. *J. Soc. Dyers & Colourists* 38, 81-4(1922).—A comparison of the Lassen-Hjort and permitté methods of softening. CHAS. E. MULLEN

Turbidity of water. P. V. WELLS. *J. Am. Water Works Assoc.* 9, 488-90 (1922).—See C. A. 15, 3704. E. J. C.

Some facts about residual alum in filtered water. A. M. BUSWELL AND G. P. EDWARDS. *Chem. Met. Eng.* 26, 826-9(1922).—The chemistry of the alum coagulation process is represented by a diagram which emphasizes both the interdependence of the various equilibria involved and the importance of the H ion. Data on the alkalinity changes during treatment do not check with calcd. values; reasons for these discrepancies are discussed. Data indicate less dissolved Al_2O_3 in the effluent than in the influent of Illinois filter plants. The amt. of Al_2O_3 did not in general exceed 2 mg. per l. Points plotted with "residual alum" and p_H values indicate a min. Al_2O_3 at a p_H of 6, which was the lowest values reached in this series. G. C. BAKER

Coagulation and sedimentation with chemicals. J. W. ELLMS. *J. Am. Water Works Assoc.* 9, 496-501(1922).—See C. A. 16, 772. E. J. C.

Water supply legislation in Ohio. W. H. DITTOE AND F. H. WARING. *J. Am. Water Works Assoc.* 9, 458-62(1922). E. J. C.

Birmingham's water works system. N. M. BERBERICK AND W. A. HARDENBERGH. *Public Works* 52, 331-4(1922).—This privately owned system has grown from 4,500 consumers in 1900 to 29,500 in 1921, using nearly 20 million gal. per 24 hr. Water is taken from 2 sources. A storage dam impounds a reservesupply. The company owns its coal mine. The water is filtered, new equipment being added to old tub filters. 0.2 p. p. m. liquid Cl is added to filtered water. The av. turbidity in 1921 was 300 in the raw water, reduced in receiving basin (125 mil. gal.) to 75, and in settling basin (30 mil. gal.) to 25. The filters remove all the bacteria except an av. of 5 per cc.

LANGDON PEARSE

Estimated and average daily water consumption in St. Louis. E. E. WALL. *Eng. News-Record* 88, 619(1922).—The annual daily av. will be exceeded by 125% for the max. month in any year by 135% for the max. week; and by 150% on the max. day.

FRANK BACHMANN

Importance of railway water supply. COMMITTEE REPORT. *Am. Railway Eng. Assoc.* 1922; *Eng. News-Record* 88, 640(1922).—Railroad water consumption aggregates 900 billion gal. at 14,000 stations involving \$100,000,000 for operation and maintenance per yr. This expense is considered small as compared to operation and repair of locomotives due to poor water supplies.

FRANK BACHMANN

Water meters and water loss in Indiana. ANON. *Eng. News-Record* 88, 612 (1922).

FRANK BACHMANN

Proposed reservoir for Boston's water supply. X. H. GOODNOUGH. *Public Works* 52, 287-8(1922).—The rept. recommends construction of a reservoir 17 miles long, 4 miles wide, storing water of Swift, Ware and Miller rivers, at a cost of \$60,000,000.

LANGDON PEARSE

Operating data for three filters using Lake Michigan water. S. A. GREELLY AND H. E. JORDAN. *Eng. News-Record* 88, 578-9(1922); cf. C. A. 15, 2141.—Data compiled for filter plants at East Chicago, Whiting, and Evanston. The plants have a rated capacity of 8, 4, and 12 million gal. per day, resp. Data indicated that the cost of coagulants in the East Chicago and Whiting plants was more than double that at Evanston. This difference is no doubt due to the character of the raw water.

FRANK BACHMANN

Substances dissolved in rain and snow. SHERMAN SHAFFER. *Chem. News* 124, 35-6(1922).—During a period of 10 months the total pptn. at Mount Vernon, Iowa was 18.14 in. of rain and 34 in. of snow. The analysis of 45 samples gave the following results: Nitrates, total 0.60126 lbs. per acre; av. content 0.3 p. p. m.; highest content

1 p. p. m. There was no variation with the season but the content was greater when the rainfall was less. Nitrites: total 0.03985 lbs. per acre; av. 0.0033 p. p. m.; highest 0.03 p. p. m. Free NH_3 : total 1.48045 lbs. per acre; av. 0.67 p. p. m.; highest 2.1 p. p. m. Albuminoid NH_3 : total 1.16022 lbs. per acre; av. 0.38 p. p. m.; highest 2 p. p. m. Chlorides: total 34.43179 lbs. per acre; av. 10.1 p. p. m.; highest 49.7 p. p. m. The chloride content was higher during winter and spring than during the fall. Sulfates: total 102.08035 lbs. per acre; av. 29.9 p. p. m.; highest 101.2 p. p. m. Sulfites: 13 detns. showed none present; the av. of the others was 1.43 p. p. m. and the highest 1.8 p. p. m. The total N was 3.28178 lbs. per acre of which 5.74% was nitrate, 0.51% nitrite and 93.73% NH_3 . In all cases the amt. of dissolved substances was greater when the interval between pptns. was greater. There was no regular difference in the amts. dissolved by rain and snow.

G. W. STRATTON

Los Angeles sewage problem again to the front. ANON. *Eng. News-Record* 88, 618-9(1922).—The city is enjoined from discharging sewage into Ballona Creek. The recommendations by the State Bd. of Health for diminishing the sewer flow has been reported against by a local Eng. Committee. A bond issue for \$12,800,000 will be voted on Aug. 12th for outfall sewer and fine screening plant.

FRANK BACHMANN

Sewage purification and history of the "Erfurt Trichter." G. STRASSBURGER. *Gesundh. Ing.* 45, 150-154, 185-89(1922).—In studying sewage decompn. S. found that 1 cu. m. of fresh sludge on decompn. formed 14.2 cu. m. of marsh gas. The time of decompn. was limited by the temp. and the amt. of acid present. In general the time required was between 3 and 5 months, the sludge vol. decreased 20-30 %, and continuous addn. of water was necessary. The gas formed was composed of H_2O , CO_2 , C_2H_6 , CH_4 , and N_2 , with a heat value of between 5516 and 4967 units, and a sp. gr. of 0.914. On removing the CO_2 and H_2O the heat value was increased to between 7818 and 8688 units, with a sp. gr. of 0.595. Engineering descriptions and explanations with drawings of the Erfurt installation conclude the paper.

MARTIN E. FLENTJE

How grit chambers work at the Worcester (Mass.) sewage plant. RAY S. LAMPEAR. *Eng. News-Record* 88, 519-20(1922).—The grit chambers at Worcester are 40 ft. long, 10 ft. wide and 9 ft. deep to normal water line. Theoretical velocity should be normally 1 ft. per sec. and slightly less during storm flows. Cleaning by hand labor and by use of an automatic crane indicates a saving in the mech. cleaning.

FRANK BACHMANN

Elimination of odor in sewage gases by burning. C. E. LEONARD. *Eng. News-Record* 88, 565-6(1922).—Owing to objectional odors, the gases from the sewage and sludge digestion compartments of the Imhoff tanks at Austin, Texas, are burned. The settled sewage gases are pumped through a safety seal to the furnace. No fuel except the natural gases from the sludge digestion are required to keep the bricks in the furnace at combustion temp.

FRANK BACHMANN

A challenge to sewage-works engineers. ANON. *Eng. News-Record* 88, 304-5(1922).—A discussion of Hatton's paper on centrifuges for sewage-sludge dewatering (*C. A.* 16, 134).

FRANK BACHMANN

Chemical and biological reaction in the Dorr-Peck tank. A. M. BUSWELL, A. A. BRENSKY AND S. L. NEAVE. *Am. J. Pub. Health* 12, 299(1922).—Chem. data on the N cycle in the activated sludge process operating with low air, together with data on the performance of Dorr-Peck tank are given. With the low amts. of air used the action of the nitrifying organisms was reversed so that nitrates and NH_3 were synthesized into protein. The N balance showed that all the N was accounted for within the limits of exptl. error and that under the conditions of the expt. there was neither loss nor fixation of N. Attention is called to the lack of correlation between the vol. and wt. of activated

sludge. The performance of the Dorr-Peck tank as designed for this expt. was not satisfactory and the app. has been withdrawn by the mfrs. A. M. BUSWITT.

Garbage removal in Leipzig. W. SCHMIDT. *Gesundh. Ing.* 45, 61-6, 74-7(1922).—Ashes and nonperishable household garbage are disposed of by filling in bogs, natural depressions and excavations, and in building up high mounds used for various municipal purposes, as memorials, etc. Perishable household garbage is treated for the recovery of fats and oils. The street refuse, not removed by mech. means, is flushed into the sewers and treated with the municipal sewage in a treatment plant; while that mechanically removed is burned or used for fertilizing purposes. MARTIN E. FLINTJH

Chlorine gas for killing garbage and other offensive odors. W. J. SPRINGBORN. *Eng. News-Record* 88, 646(1922).—The Henderson-Haggard Cl process consists of injecting liquid Cl gas into a mixing chamber where it combines with the collected odorous gases, immediate oxidation taking place with the destruction of all odors. The process is also applicable to sewer gas. FRANK BACHMANN

Engineer's plans for State Health Boards. ANON. *Public Works* 52, 341-2(1922); cf. C. A. 16, 1999. LANGDON PEARSE

Application of ion-concentration measurements to the control of industrial processes (KEELER) 1.

KLUT, HARTWIG: Untersuchung des Wassers in Ort und Stelle. 4th revised ed. Berlin: Julius Springer. M45. Reviewed in *Gesundh. Ing.* 43, 239(1922).

Apparatus for purifying boiler feed water. L. SAVARY-CARLIER. U. S. 1,413,937, Apr. 25.

Sterilizing water and sewage. J. C. BAKER. U. S. 1,413,153, Apr. 18. A soln. of Cl and H₂O is passed through crushed limestone and then mixed with H₂O or sewage to be sterilized.

Apparatus for separating components of sewage. C. P. LANDRETH. U. S. 1,412,945, Apr. 18.

Purifying wasteliquids. E. POSSEYER ABWASSER-UND WASSERREINIGUNGS GES. Brit. 175,285, Feb. 10, 1922. Phenols are removed from waste waters by extrn. with benzene after acidifying, preferably by treating with acid resins obtained in benzene purification; for further use, the benzene is freed from phenol by means of NaOH soln. A process and app. are described for removing phenol from alk. waste waters from NH₃ works. The waters are freed from solid matter by settling, acidified, preferably by passing part of them through acid resins, and agitated with benzene or "another org. liquid produced by the pyrogenic decompn. of coal or brown coal;" the waste liquid is run off and the benzene agitated with NaOH soln. to remove phenol; fresh waste liquid is then run into the benzene and so on. The NaOH soln. is used repeatedly. The residue from the acid resins used in the neutralizing process may be used as fuel or as insulating material.

Device for volatilizing disinfectants. V. WINTSCH, JR. U. S. 1,413,448, Apr. 18.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER AND ALBERT R. MERZ

Technical report of the government chemist for 1921. A. F. JOSEPH. Sudan Govt., Chem. Sec., *Publ.* No. 22, 38 pp.(1922).—A summary of the examns. of forest products, drugs, and poisons, milk, soil and waters, also of field expts. conducted jointly

with the govt. botanist, and a comparison of lime-homra (homra is the name given to crushed brick) with cement-sand mixts. for masonry. The latter work is not completed.
W. H. BOYNTON

The silt loam soils of eastern Washington and their management. F. J. SIKKERS AND H. F. HOLTZ. Washington Agr. Expt. Sta., *Bull.* 166, 62 pp. (1922).—The Palouse silt loam soils of Washington are fertile as compared to many of the representative silt loam soils of the U. S. They are rich in plant food. The following compn. is given: total N 0.202%, P 0.082%, K 1.80, Ca 1.508, org. C 2.595. The N-C ratio is 1-12.8. A study of moisture, nitrate N and tillage shows that fall plowing or early spring plowing packed gives the greatest conservation of moisture and highest crop yield. Large crop yield is usually associated with high N content but where org. matter is low accumulation of nitrate may injure crops. During 39 years 22.1% N and 34.5% org. matter have been lost from the soil, only a small part of which is accounted for in the crops removed. The dry summers make it difficult to decompose straw and other low N crop residues and the presence of such material has a depressing effect on nitrate formation. The injurious effect of straw is more pronounced when soil org. matter is low; hence the difficulty of maintaining soil org. matter becomes more pronounced as soils become more depleted.
M. S. ANDERSON

Investigations on the effective value of nutrients of soils on the basis of vegetative experiments and solubility determinations, as well as on the production value of different plant nutrient materials. O. LEHMERMANN, L. FRESSENIUS AND H. WIESSMANN. *Landw. Vers. Sta.* 98, 155-85 (1921).
F. M. SCHERTZ

The solubility of gypsum in products of protein decomposition. R. P. HÄUSSLER. *Landw. Vers. Sta.* 99, 60-64 (1921).—Protein decompn. increases the soly. of gypsum in water. Gypsum plays an important role in the soil. Peptone is found in field soils.
F. M. SCHERTZ

Influence of "Brache" or stable manure fertilization upon the yield and the nitrogen economy in soils. TH. PFEIFFER. *Landw. Vers. Sta.* 98, 187-222 (1921).
F. M. S.

Common sense and fertilizer manufacture at Muscle Shoals. W. S. LANDIS. *Chem. Age* 30, 149-50 (1922).
P. R. D.

Relative growth response of crops to each fertilizer ingredient and the use of this response in adapting a fertilizer analysis to a crop. BURT L. HARTWELL. *J. Am. Soc. Agron.* 13, 353-9 (1921).—Presidential address, in which a grouping is given of 21 agricultural crops showing their relative response to each of the fertilizer nutrients.
F. M. SCHERTZ

Wool scouring wastes for fertilizer purposes. F. P. VEITCH. *J. Ind. Eng. Chem.* 14, 434 (1922).—Expts. on a mfg. scale demonstrated the practicability of utilizing such wastes by mixing with other waste materials and as a constituent of "base goods." The concd. liquid wool scouring waste liquor contains 42% H₂O, 14% K₂O, 1.25% N, and 14% grease; dried and degreased waste contains 24.5% K₂O, 2.5% N (original gives 25.5%; correction is made in *Ibid* 572), and 0.6% grease. Fertilizer material made from the concd. waste and another waste contains 6.5% H₂O-sol. K₂O, 6.1% total N, 3-4% H₂O-sol. N, 1.9% alk. KMnO₄, and 1% neutral KMnO₄-insol. N, and 6.8% grease.
P. R. DAWSON

The role of manganese in agriculture. H. BOCHER. *Compt. rend. acad. agr. France* 8, 323-5 (1922).—An inquiry regarding the use of Mn as a fertilizer.
F. M. S.

Incrustation action of magnesium salts (potash fertilizer salts). A. NOSTRIZ. *Landw. Vers. Sta.* 99, 27-40 (1921).—Mech. expts. and chem. analyses make it appear probable that the Mg content of K fertilizer salts is concerned in incrustation.
F. M. SCHERTZ

The determination of phosphorus oxide in fertilizers. J. C. VOGEL. *J. Soc. Chem. Ind.* **41**, 127-9T(1922).—Closely agreeing results were obtained in the analysis of superphosphate, phosphate rock treated with NaHSO_4 , and Egyptian phosphate rock dust when using the official gravimetric, the Woy gravimetric and the Kilgore volumetric methods. A rapid volumetric method was devised for detg. the water-sol. P_2O_5 in superphosphate. This method consists in adding to 10 cc. of the superphosphate soln., prepared according to the official method, an excess of a standard lime soln. The excess of alkali is titrated with 0.05 *N* HCl, phenolphthalein being used as indicator. Fifty cc. of the superphosphate soln. is then titrated with the lime soln., methyl orange being used as indicator. The difference between the vols. of lime soln. required for neutralizing the same vol. of superphosphate soln. is the equiv. of the $\text{Ca}(\text{H}_2\text{PO}_4)_2$ present. Standard NaOH soln. may be used in place of the lime soln. W. H. ROSS.

The determination of the value of calcium cyanamide. F. MACH. *Landw. Vers. Sta.* **98**, 125-7(1921).—A discussion. F. M. SCHERTZ.

Copper and mildew. G. VILLEDIEU. *Rev. vit.* **56**, 263-9(1922); cf. *C. A.* **16**, 983.—Polemic. P. R. D.

CAMERON, FRANK K.: *The Soil Solution*. Easton, Pa.: Chemical Publishing Co. 136 pp. \$2.

HALLIGAN, JAMES EDWARD: *Fertility and Fertilizer Hints*. Easton, Pa.: Chemical Publishing Co. 155 pp. \$1.50.

HALLIGAN, JAMES EDWARD: *Soil Fertility and Fertilizers*. Easton, Pa.: Chemical Publishing Co. 398 pp. \$4.

Fertilizer. G. EDGAR. U. S. 1,413,013, Apr. 18. Ca cyanamide is decomposed with an acid such as H_2SO_4 in excess of that necessary to neutralize the free and combined lime and the excess acid is then neutralized with a fertilizer material such as ground phosphate rock.

Fertilizer. A. L. KREISS. U. S. 1,413,168, Apr. 18. Phosphate rock is treated with a soln. of Na_2CO_3 , Na_2SO_4 and K_2CO_3 in a heated drying app.

Superphosphate manufacture (utilizing alunite). A. MATHESON. U. S. 1,413,048, Apr. 18. See Brit. 158,293 (*C. A.* **15**, 1960).

Fertilizer from sharks and fish refuse. R. M. THOMPSON. U. S. 1,413,200, Apr. 18. A meal-like prepn. is formed from whole shark bodies or similar fish or fish refuse by heating, expressing oily substances and then further heating.

Insecticidal fumigating composition. H. L. SCHULZ. U. S. 1,412,065, Apr. 11. Tobacco stems, added nicotine, charcoal and KNO_3 (adapted for fumigating green-houses).

16—THE FERMENTATION INDUSTRIES

C. N. FREY

Greater utilization of alcohol. KULENKAMPFF. *Chem.-Zig.* **46**, 345(1922).—Contains a discussion of the alc. industry in Germany relative to the raw materials available at present and to possible sources of future supply. Production will soon exceed demand and new uses must be found.

C. N. FREY

The abnormal wines of 1921. FONZES-DIACON. *Prog. agr. vit.* **77**, 373-5(1922).—To wines contg. excess of K was added tartaric acid in concns. of 60 g. per hectoliter. After several months' standing the total K (expressed as bitartrate) was essentially

the same as in untreated wines; the tartaric acid content was increased in proportion to that added; the total acidity was increased by the amt. of tartaric acid added.

P. R. D.

New acid fermentation produced by *Sterigmatocystis nigra*. MARIN MOLLIARD. *Compt. rend.* 174, 881-3(1922).—*S. nigra* was cultivated on a medium contg. less than the normal sucrose and 1/25 of the amt. of N and mineral salts necessary for its best growth at 36°. At the end of 10, 20, 30, and 40 days the dry mycelium weighed 779, 845, 994 and 1150 mg. The acidity was 12.3, 13.6, 11.9, and 10.9 cc. N acid, and the sucrose consumed 5145, 5812, 6555 and 6856 mg., resp. By doubling the amt. of sucrose, the growths in the same periods of time were of dry mycelium 1015, 1134, 1295 and 1299 mg. The acidity was 37.4, 38.0, 36.4 and 32.4 cc. N acid, and the sucrose consumed 9216, 10469, 11700 and 12762 mg., resp. Citric acid appeared in traces on the 6th day and on the 20th, 30th and 40th days was 330, 389 and 289 mg., resp. An acidity of 32 cc. N acid was obtained on the 4th day. Diminution of P in the medium results in strong acidity from a mixt. of citric and oxalic acids. Reduction of K appears to increase the amt. of (COOH). In a normal medium for *S. nigra* only traces of acids are set free, and apparently a normal respiration of the organism takes place. L. W. RIGGS

Pressure developed by alcoholic fermentation. R. KOLKOWITZ. *Ber. bot. Ges.* 39, 219-23(1921).—Although the viability of yeasts and other microorganisms is not affected by pressures amounting to thousands of atms. and yeast cells occur and vegetate normally in marine oozes under pressures of more than 30 atms., the pressure developed by the evolution of CO₂ in alc. fermentation is generally estd. as little more than 12 atms. Working with a specially constructed app., K. was able to obtain a pressure of 40 atms. by fermentation for 3 to 5 hrs. The gradual slowing down of the evolution of CO₂ which was observed is attributed to narcosis by the dissolved gas rather than to the direct effect of the pressure produced. Microscopic examn. showed that the older yeast cells which had been exposed to high pressure had suffered injury by contraction of their protoplasmic contents. The younger cells appeared homogeneous. Placed in a fresh nutrient soln. under normal pressure, fermentation took place relatively slowly at first. The expts. show that yeast fermentation is possible under relatively high pressures, and that it is not necessary to assume the existence of yeast organisms specially adapted to high pressures in the greater depths of the sea. J. C. S.

The consumption of oxygen and the fermentative power of yeast preserved with toluene or fluoride. J. GAJA AND B. MALES. *Compt. rend. soc. biol.* 86, 703-5(1922).—Yeast treated with either toluene or fluoride uses up O about as much as live yeast, but this power is lost when the yeast is boiled. Alongside the consumption of O there is a production of CO₂ but the authors are not certain whether this is due to a process of autofermentation or is actually associated with the O consumption. S. M.

Live yeast and yeast preserved with toluene behave similarly towards the sugar medium. J. GAJA. *Compt. rend. soc. biol.* 86, 705-7(1922).—As is indicated by the title G. shows that within a concn. of from 1 to 10 % of sugar the process of fermentation is the same for treated and untreated yeast. S. MORGULIS

Utilization of final molasses (CARPENTER) 28.

Drying yeast. E. KLEIN. *Brit.* 175,622, Feb. 10, 1922. Yeast is reduced as finely as possible while being dried by an air current passing through it, and is carried away, preferably by the air current, as the drying advances, to allow the use of higher temps. and lower pressures.

Drying yeast. E. KLEIN. *Brit.* 175,623, Feb. 10, 1922. Starch, phosphates,

Na_2CO_3 , maltose, dextrin, sugar, etc., are added together or successively, or any one of them alone, during the drying of yeast. Water-absorbing substances may be added when the yeast has been dried to a H_2O content of about 60%, substances which stimulate the formation of enzymes, such as sugar, and those such as salt which accelerate the escape of H_2O from the cells may be added when the H_2O content is reduced to or below 40%.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

"Novalgin," a new antipyretic and analgesic. A. AUER. *Deut. med. Wochschr.* 48, 91-2(1922).—"Novalgin" is Na phenyldimethylmethylaminopyrazolonesulfonate. It can be given *per os*, or subcutaneously or intravenously, when it acts best. The dosage *per os* is 0.1-0.2 g. 6-10 times a day or 0.5 gr. 3 times, for parenteral administration 0.25-2 g. per day. It is a very good antipyretic and analgesic and a specific for acute or chronic polyarthritis. No untoward effects were noted. S. A.

The preservation of standard uranium solutions. *Union pharmaceutique* Jan. 15, 1922; *Ann. chim. anal. chim. appl.* [2] 4, 144(1922).—A violet ppt. due to reduction of U acetate sometimes seps. from standard U solns. prepd. with Codex AcOH and kept in well-stoppered and nearly completely filled bottles. This has been traced to the presence of traces of formic acid too small to be detected by the ammoniacal AgNO_3 test of the Codex, but sufficient to reduce the U acetate under the influence of light. The reduced U salt is very readily oxidized back, and any change in the soln. can be prevented by keeping it in yellow bottles which are incompletely filled. Even when the AcOH contains appreciable amts. of formic acid reduction is thus prevented by the presence of the large excess of O. A. P.-C.

The system camphor-alcohol-water in relation to the titration of spirit of camphor. K. SCHERINGA. *Pharm. Weekblad* 59, 389-95(1922).—The titration test given by the Dutch Pharmacopeia for detg. the % of camphor in spirit of camphor is based upon the amt. of H_2O required to produce turbidity. It is unreliable for 2 reasons: first, the end-point varies with the temp. which is not specified, and second, tinctures with low camphor content respond to the test if the proper amt. of H_2O is already present. S. has plotted the isotherms of equil. for the system camphor-EtOH- H_2O at 0°, 15°, 25°, 40°, and showed that titration with H_2O alone is not sufficient. The following modification is proposed: (1) Dissolve 1.8 g. of camphor in 10 cc. of the sample. The solution must remain clear at 15°. (2) Add 2.8 cc. of H_2O to 10 cc. of the sample. The soln. must remain clear at 15°, but should give a turbidity with further addition of 0.3 cc. H_2O . A. W. DOX

Sample of adulterated peppermint oil. S. MARSHALL AND M. S. SALAMON. *Perfumery Essent. Oil Record* 13, 105(1922).—A sample of oil described as "French Peppermint Oil" possessed phys. consts. indicative of the genuine product and yet proved on careful examn. to be nothing more than a rectified dementholized Japanese peppermint oil to which castor oil and alc. had been added in such proportions as to bring the phys. and chem. characters of the sample within range of figures usually ascribed to French oil of peppermint. W. O. E.

Monographs on floral odors. IX. Orchids, honeysuckle and carnation. P. P. R. *Perfumery Essent. Oil Record* 13, 106-8(1922); cf. C. A. 16, 1832.—In addn. to brief descriptions of the flowers themselves, many practical suggestions are made for compounding the basic and flower oils. Attention is also directed to the importance of amyl salicylate in perfumes of this character. W. O. E.

The most important medicaments of veterinary medicine. A. GLUSCHKE. Z. angew. Chem. 35, 157-60, 169-71, 213-6(1922). W. O. RIMERY

Studies in extraction. II. The rate of extraction of cascara sagrada. J. F. COUCH. Am. J. Pharm. 94, 168-71(1922).—The extrn. of the official bark of cascara sagrada proceeds regularly with diminishing velocity. The factors which det. the rate of extrn. are those found in the study of *Phytolacca* (see C. A. 15, 2958). A quantity of percolate equiv. to 300 ml. per 100 g. of drug extd. 95% of the total ext. Cascara is somewhat more difficult to ext. than *Phytolacca*. The change in alc. content of the percolate was studied quant. and the results are reported. Cf. C. A. 15, 2958.

W. C. GAESSLER

Critical temperature of solution of lemon oil. GUINO AJON. Giorn. chim. ind. applicata 4, 8-12(1921).—Conclusions: (1) The detn. of the crit. temp. of soln. is one of extreme delicacy and should always be performed under equal exptl. conditions, especial care being given to the reading of liquid vols. and of temps. (2) The soly. of an oil in alc., and therefore its crit. temp. of soln., is closely related to the d. of the solvent alc., small variations of which cause appreciable differences in the case of the values for the direct oils as well as for the distillates. Alcs. of higher d. are better adapted to show adulterations with terpenes, because with such alcs. the crit. temps. are higher for adulterated oils. (3) As regards increased amts. of oxygenated compds. the final fractions of distn. have a greater soly., corresponding to which are lower crit. temps. of soln. (4) In the case of oils from which the citral has been wholly or in part removed such oils show higher crit. temps. before as well as after distn.

ROBERT S. POSMONTIER

Chemical composition of ergot of diss and ergot of oats. GEORGES TANREY. Compt. rend. 174, 827-30(1922).—Diss, *Ampelodesmos tenax* Linck, is a wild grass from East Algiers, which is infested with ergot having properties analogous to those of rye ergot. Ten kg. of diss were ground fine, extd. with warm 85% alc., the alc. was distd. off leaving a red aq. liquid and a mixt. of fats and resins. The fats were removed by ether. The extrn. of ergotinine from the residues failed by the usual methods, but by a process to be given in another paper 0.1 g. of crude ergotinine was obtained from 1 kg. of diss. This consisted of about equal parts of cryst. and of amorphous ergotinine. The fatty material contained 4 to 6 times as much ergosterine as the ergot of rye. The aq. liquid from 10 kg. of ergot (or diss?) yielded mannitol 8.8 g., trehalose 0.7, glucose 2.8, and ergothioneine 4.0. The detn. of the various constituents in ergot of oats from Algiers is described in detail. The results show that ergot of diss and of oats contains the same substances as ergot of rye but the proportions of these substances vary widely with the source. That from diss is low in cryst. ergotinine and that from oats is richer in ergotinine than the av. of rye ergot. It is suggested that ergot of oats may well compete with that from rye, and in seasons of failure from these sources the ergot of diss may be used. Also in Bull. soc. chim. 31, 441-8.

L. W. RIGGS

The chaulmoogra tree and some related species. J. F. ROCK, DAVID FAIRCHILD AND F. B. POWELL. U. S. Dept. Agr., Bull. 1057, 1-29(1922).—This bulletin gives the chem. and phys. properties of chaulmoogra, hydnocarpus and gyncocardia oils obtained by expressing the seeds of the chaulmoogra tree and related species, and also of chaulmoogric and hydnocarpic acids which occur as glyceryl esters in the 2 oils first mentioned.

W. H. ROSS

The assay of pituitary preparations and other uterine stimulants. M. KOCHMANN. Z. physiol. Chem. 115, 305-10(1921).—A method is described which permits the use of guinea pigs of any wt.; even pregnant animals may be employed. The isolated horn of the uterus is suspended in 30 cc. Ringer soln. (aerated and maintained at 35°) in such fashion as to permit the recording of its movements. If regular contractions occur, the Ringer soln. is replaced by a similar soln. contg. only 0.1 the normal quantity of Ca.

During the relaxation, which occurs immediately, 1 cc. of 1% $MgCl_2$ is added. The uterus then remains relaxed and quiet. In some cases the addn. of $MgCl_2$ is superfluous. 0.2 cc. of 1 : 100,000 histamine soln. is then added and the contraction recorded. The contents of the cylinder are next removed and the prepn. is washed 5 times with normal Ringer soln. and 3 times with the Ca-poor Ringer soln. After adding $MgCl_2$ 0.4 cc. of histamine soln. is added and the contraction is again recorded. Thereupon the process is repeated as often as may be necessary, with increasing amts. of histamine soln., and eventually with the substitution of 0.2 cc. of different dilns. of the prepn. being assayed. Finally, it is necessary again to test the activity of the muscle at the end of the assay. To facilitate the numerous changes of solns., the glass tube to which the lower end of the uterus prepn. is fastened is connected by means of a 3-way stopcock with (1) a funnel for filling, and (2) with a filter pump for removing solns. R. L. STANLEY

Novocaine-adrenaline solution for local anesthesia. P. BRETEAU. *J. pharm. chim.* 25, 97-8(1922).—Sterilization of novocaine by heat lessens its activity as an anesthetic. Dissolve 4 g. $BzOH$ in 1 l. of sterilized hot H_2O , cool and filter. Mix 1 g. novocaine with 100 drops of adrenaline soln. (1:1000) and 100 g. of the satd. $BzOH$ soln., and put the mixt. into 5 cc. ampules previously washed and sterilized. The $BzOH$ preserves the activity effectively. S. WALDBOTT

Adrenaline solution for injections. L. DEBUCQUET. *J. pharm. chim.* 25, 136-9(1922); cf. *C. A.* 15, 2335.—A satd. aq. soln. of $BzOH$ is used as a preservative (cf. preceding abstr.), preventing the formation of molds. Boil H_2O for 15 min., then add $BzOH$, 4 g. per l., cool, and filter after 12 hrs. Add 1 g. adrenaline to about 666 cc. of the soln., then 7 g. pure $NaCl$, bring to 1000 cc. with the $BzOH$ soln. and filter through paper, avoid direct light. Then put the soln. into ampules previously sterilized by dry heat. The acidity is 2.928 g. $BzOH$ per l. and the soln. is isotonic to blood serum (f. p. -0.56° to -0.57°). There are 22.5 drops per 1 g. by the Duclaux drop-counter. The soln. is very sensitive to NH_3 , turning pink. Its $[\alpha]_D^{25} -53^\circ$ remains const., which is a requisite to max. physiol. activity (Tiffeneau, *C. A.* 15, 2336). The combination of the soln. with novocaine is especially useful in dental practice. S. W.

Solution for the washing of wounds and for dressings. P. BRETEAU. *J. pharm. chim.* 25, 98-99(1922).—Take $NaHCO_3$ 11 g.; H_2O sufficient to make 1 l.; $CHCl_3$ 1 cc.; coloring: 0.01-0.02 g. K_2CrO_4 , or a few drops of Congo red, Poirrier orange, auramine or methylene blue. The dose of $NaHCO_3$ may vary according to the tonicity of the soln. desired, each having its characteristic color. The cryoscopic depressions of the soln. for amts. of $NaHCO_3$ varying from 10 g. to 20 g. increase from -0.50° to -0.92° . The soln. is non-caustic and the dressings made with it are odorless. S. W.

The arsenobenzenes. H. MARTIN. *J. pharm. chim.* 25, 122-5(1922).—A plea for governmental supervision of the characters of these compds., pending their explicit adoption in the French Codex. S. WALDBOTT

Henri Lajoux. E. BOISMENU. *J. pharm. chim.* 25, 125-7(1922).—An obituary. S. WALDBOTT

Determination of alkaloids in extract of aconite. A. ASTRUC, E. CANALS and R. BORDIER. *J. pharm. chim.* 25, 161-4(1922).—The method given in the French Codex, which requires not less than 1% of total alkaloids, uses an insufficient amt. of Et_2O in their extn. In 6 com. samples, this method gave less than 1% of alkaloids, while complete extn. with more Et_2O yielded 1% in all cases. S. WALDBOTT

Estimation of aldehydes and ketones (BENNETT, DONOVAN) 7. Tohaku oil (IWA-MOTO) 27. Hydrolytic cleavage of phenolcarboxylic acids from their bismuth salts (PERLING) 10.

LE FLORENTIN, RENÉ: Les cosmétiques. Paris: Librairie Desforges, 29, quai

des Grands-Augustins. 208 pp. 6.75 fr. Reviewed in *Bul. soc. ind. Mulhouse* 87, 609(1921).

MASCARELLA, LUGI: *Lezioni di chimica farmaceutica e tossicologica-Parte inorganica*, 1920-1. Torino: G. Castellotti, via Bogino, 3. L. 70. Reviewed in *Giorn. pharm. chim.* 71, 27(1922).

Thymol. F. GÜNTHER. U. S. 1,412,937, Apr. 18. Thymol is formed by treating sulfonated *m*-cresol with isopropyl alc. and strong H_2SO_4 and then splitting off the sulfonic group.

Extracting essential oils. F. L. USHER and E. P. METCALFE. Brit. 176,104, Nov. 26, 1920. Essential oils and like volatile products are extd. from solid materials such as sandalwood, by means of a heated gaseous vehicle such as N or other inert gas or an unsatd. vapor which is not condensed on cooling to sep. the essential oil or by means of steam which is condensed in such a way as to generate a further quantity of steam for use in the extn. In using an inert gas, the gas is circulated in a closed circuit through a heater, extn. vessel, heat exchanger, condenser, pump and back through the heat exchanger and heater to the vessel. The heater may be formed as a jacket surrounding the vessel contg. a steam coil or an elec. heater. In using steam for the extn., the steam is passed through an extn. vessel and to a condenser which forms a vacuum evaporator, *e. g.*, of the Kestner climbing-film type. The condensation of the steam and essential oil serves to generate steam at a lower pressure, which is compressed by a pump and passed into the extn. vessel. The condensed H_2O is sepd. from the essential oil in a vessel and may be passed into the well to be evapd. in the condenser. A float device serves to maintain a definite level of H_2O in the condenser.

Vaporizing perfumes, etc. F. WATERSON. Brit. 175,387, Nov. 12, 1920. Perfumes, volatile medicaments, etc., are vaporized and distributed by means of hand or rotary fans. Solid volatile material or absorbent material satd. with liquid is supported between the fan blade or blades, or the guard of a rotary fan, and a single layer of porous material. A suitable construction is specified.

Organic silver alcosols. J. ALTWEGG. U. S. 1,413,151, Apr. 18. Ag oxide is warmed with H and a slightly acid soln. of an org. protective agent such as resin or Na salt of "gall acids" in alc. and the alcosol produced is pptd. with ether.

Colloidal medicinal compounds of antimony sulfide. M. E. WOLVEKAMP. U. S. 1,412,438, Apr. 11. Colloidal Sb sulfide prepus. which can be sterilized by boiling without decompn. are prepd. by the use of Na lysalbinat, Na protalbinat from serum or similar protective colloids. Details are given for the prepn. of colloidal products from Sb_2S_3 and Sb_2S_5 , the former being proposed as a therapeutic agent in the treatment of leishmaniosis of children and the Sb_2S_5 prepn. being suitable for use as a veterinary remedy instead of Schlippe's salt.

Therapeutic colloidal sulfarsenite preparations. M. E. WOLVEKAMP. U. S. 1,412,439, Apr. 11. Na protalbinat or Na lysalbinat or similar protective colloids are used to prepare therapeutic prepn. of mono-Hg sulfarsenite, tri-Hg sulfarsenite or mono-Ag sulfarsenite, which may be sterilized by boiling and may be evapd. to dryness without losing their soly.

Mercury derivatives of aurintricarboxylic acid. M. E. WOLVEKAMP. U. S. 1,412,440, Apr. 11. Antiseptics suitable for disinfecting surgical instruments and which are readily sol. in NaCl solns. are prepd. from aurintricarboxylic acid and either 1, 2 or 3 mol. proportions of $HgCl_2$, the mono-, di-, and tri-mercuric aurine tricarboxylates thus prepd. contg., resp., 30.7%, 47.6% and 59.3% Hg. Details are given for the prepn. of these compds. either with or without NaCl.

Diethylaminoethyltheobromine. J. ALTWEGG. U. S. 1,414,333, May 2. This compd. m. 67°, somewhat sol. in H₂O, forming aq. solns. having a strongly alk. reaction, and sol. in most org. solvents, is prepd. by reaction of theobromine-Na on chloroethyl-diethylamine in C₆H₆ soln. Its hydrochloride m. 202° and is a non-irritating diuretic suitable for injection.

Selenium nitrosulfone. F. KLEIN. U. S. 1,412,873, Apr. 18. Se nitrosulfone, a white fine cryst. hygroscopic compd. less sol. in alc. than in H₂O and still less sol. in ether than in alc., having a bitter astringent taste and nontoxic in doses of 0.001–0.002 g., is prepd. by treating nitroselenious acid with SO₂ and adding KHCO₃ to form the K nitrosulfone. It is adapted for use in the treatment of carcinoma.

Beverage. J. TAKAMINE, JR. U. S. 1,412,378, Apr. 11. A protecting substance such as sugar is added to enzymic preps. before mixing with alc. in order to avoid deleterious action of the alc. upon the enzymes, *e. g.*, in digestive cordials.

Medicinal plaster or ointment. E. P. KELLER. U. S. 1,414,815, May 2. Ichthyol, belladonna and benzoinated lard are used together for the treatment of pneumonia.

Liniment. D. MOTTURA. U. S. 1,412,129, Apr. 11. A mixt. of castor oil, salt, KNO₃, pepper, pine tar, verbena essence, Venice turpentine and H₂O.

Ampul for ethyl chloride and similar liquids. J. BENGUE. U. S. 1,414,169, Apr. 25.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

The packed cell process for sulfuric acid. E. L. LARSON. *Chem. Met. Eng.* 26, 830–7(1922).—The lead chamber process is modified by the substitution for the chambers of "packed cells," acid-proof masonry towers filled with a brick grillage. Over these a strong circulation of acid in process is maintained, which is artificially cooled. The make-up water is added to this circulation. The original cost of the plant is 50–60% of that of an equivalent lead chamber plant; the operating cost is no greater, the ground area is only 30–40% and the plant can be started up in a much shorter time. Cost details and details of operation are given.

F. C. Z.

Hypochlorous acid and chlorine, with comparison of their bleaching action. R. L. TAYLOR. *Am. Dyestuff Rep.* 10, 329–30, 347–9(1922).—Bleaching by Cl may not be altogether due to the decompn. of H₂O as the Cl may act directly on the coloring matter. Contrary to the views of Higgins, T. considers Cl a better bleaching agent than HClO.

L. W. ROGGS

Catalysis and the synthesis of ammonia. PAUL FIRMIN. *Industrie chimique* 9, 147–51(1922).—A brief and general discussion of catalysis, the influence of pressure, temp., velocity of the gases, nature of the catalyst, extent of catalytic surface and of surface reactions, with particular reference to the synthesis of NH₃. A. P.-C.

The manufacture of sodium dichromate and its control. GUSTAVE BRESSA. *Industrie chimique* 9, 143–7; *Chem. Trade J.* 70, 595–6(1922).—A description of the com. manuf. of Na₂Cr₂O₇·2H₂O, of the detns. carried out in the works control of the process, and of the sanitary precautions which should be taken. One of the characteristic ailments of this industry is ulceration and perforation of the nasal septum, which is attributed to the inhalation of the dust and vapors contg. Cr compds. Every precaution should be taken to prevent escape of dust into the rooms, and the workmen should wear masks and gloves which should be kept scrupulously clean. The use of gauze contg. salicylic acid, in the nostrils, is an effective preventive. Cauterization with AgNO₃ and the application of ZnO and salicylic acid ointment has been used successfully as a cure.

A. P.-C.

Action of nitrogen on mixtures of barium oxide and charcoal at high temperatures. P. ASKENASY AND F. GRUDE. *Z. Elektrochem.* 28, 130-51(1922).—The fixation of N by highly compressed mixts. of BaCO_3 and wood charcoal or graphite, without a binding material, has been studied at different temps. up to 1600° . At 1400° the reaction proceeds with a velocity sufficiently great to be of practical use. In 15 min. at this temp. about 60% of the Ba present is converted into $\text{Ba}(\text{CN})_2$ and BaCN_2 in the presence of an excess of N. The primary reaction probably consists in the formation of BaC_2 . Under the conditions employed this is converted into $\text{Ba}(\text{CN})_2$ which then changes to BaCN_2 . The formation of $\text{Ba}(\text{CN})_2$ reaches a max. (85%) at 1300 – 1400° , which is not exceeded at 1600° . The formation of BaCN_2 increases rapidly with temp. The reaction proceeds most favorably in the presence of an excess of C and with briquets of BaCO_3 and C made under high pressure. With a loose mixt. of these substances the reaction is much slower. Impurities in the charcoal, such as SiO_2 or Al_2O_3 , retard the reaction. The absorption of N by a mixt. of BaO and C and by BaC_2 is the same; in both cases the ratio $\text{Ba}(\text{CN})_2 : \text{BaCN}_2$ is identical. Previous work on this general method of N fixation is reviewed and a comprehensive bibliography is appended.

H. JERMAIN CRUGHTON

Plant of the Northern Explosives Co., Ltd., Dragon, P. Q. [acid manufacture] (DONALD) 24. Spontaneous ignition of escaping H (*MESSELT*) 24.

Hydrochloric acid. C. P. TOWNSEND. U. S. 1,414,762, May 2. Cl is supplied to an app. contg. H at a substantially const. rate to form HCl which is withdrawn. Appropriate pressure within the app. is maintained by control of the H supply.

Borax; boric acid. A. KELLY AND R. B. R. WALKER. *Brit.* 175,201, March 3, 1921. See *Can.* 213,223 (*C. A.* 16, 1134).

Synthetic ammonia. L. CASALE AND H. LEPRESTRE. *Brit.* 176,144, Dec. 2, 1920. In an app. for the catalytic synthesis of NH_3 , the elec. heating-coil is disposed within but out of contact with the catalyst. A suitable app. is specified. Cf. *C. A.* 16, 1641.

Ammonia; titanium oxide. P. ANDREU AND R. PAQUET. *Brit.* 175,989, Feb. 23, 1922. The extn. of Ti from titaniferous Fe ores, rutile, anatase, etc., together with the fixation of N, is effected by heating in N a mixt. of the ore, charcoal, and a salt of a metal, alkali, or alk. earth, for instance Na_2CO_3 . The heating is effected at not more than 1850° . NH_3 is obtained by treating the product with steam at a temp. not above 1800° . The residue is washed to obtain a titanate from which Ti oxide is obtained by hydrolysis or by treatment with acids. Alternatively, if it is not required to ext. Ti from ores, the ore is heated in N with C only, the product being steamed to obtain NH_3 , and the residue being used again.

Alumina low in iron. V. M. GOLDSCHMIDT AND O. RAVNER. U. S. 1,413,720, Apr. 25. Labradorite is treated with HNO_3 to obtain a neutral nitrate soln. which is filtered and treated with CaCO_3 or other material to ppt. Fe and SiO_2 . The soln. is evapd. and the residue is calcined to decompose the Al nitrate selectively and other nitrates are removed by lixiviation. Cf. *C. A.* 15, 3372.

Alumina from nitrate solutions. T. MEJOELL. U. S. 1,413,754, Apr. 25. An Al nitrate soln. is heated to distil off HNO_3 with addn. of HNO_3 to keep the temp. practically const. and the basic Al nitrate which is formed is sepd. and calcined.

Apparatus for table salt manufacture. KATSUNOSUKE KANAZAWA. *Jap.* 38,760, June 1, 1921. Diagrammatical description. Salt water, previously heated, is sprayed in a rotating and heated conical drum, by which evapn. is quickly effected.

Pure table salt. KIYOJI SHIBA. *Jap.* 38,742, May 26, 1921. By mixing concd.

NaCl soln. of 23–26° Bé., obtained from sea water, and a special brine of above 34° Bé. pure NaCl crystallizes out as fine crystals, which are further purified by washing with dil. sea water. The special brine is prepd. from concd. sea water, from which NaCl is previously crystd. out and SO_4^{--} is pptd. with CaCl_2 , leaving MgCl_2 mainly. The mother liquor, from which NaCl is crystd. out, is changed to the special brine by the elimination of SO_4^{--} .

Potassium chloride. G. A. BLANC and F. JOURDAN. Brit. 175,348, Oct. 15, 1920. Rocks contg. potash, such as leucite, are treated in countercurrent in a furnace with gaseous HCl, the temp. being about 600° at the outlet and 300° at the inlet end. The chlorides other than alkali chlorides are decompd. by the time the material reaches the outlet end, and the chlorides are leached out from the product. The HCl may be produced by the Hargreaves process, the KCl produced by the main process being used and the HCl being used directly in the hot state.

Aluminum chloride. E. R. WOLCOTT. Brit. 175,006, Nov. 1, 1920. See Can. 217,051 (C. A. 16, 1839).

Ammonium sulfate. N. WILTON. U. S. 1,412,549, Apr. 11. See Brit. 154,328 (C. A. 15, 1059).

Alkali hypochlorite. L. D. VORCE. U. S. 1,414,059, Apr. 25. Cl is brought into contact with a soln. of caustic alkali at a temp. below 30°, excess Cl being avoided, to form hypochlorite without reversion.

Bleaching solution. P. E. NELSON. U. S. 1,414,039, Apr. 25. An aq. soln. formed from "chloride of lime," NaOAc, NaHSO_3 and Na_2CO_3 is prepd. for laundry use.

Sodium pentaborate. K. HARDING and B. D. JONES. Brit. 175,795, Dec. 3, 1920. Na pentaborate is obtained by treating a boron ore with niter cake or the like and H_2SO_4 in such quantity that the free H_2SO_4 is equiv. to the Ca of the ore and the Na in the niter cake or the like, together with the Na in the ore, is sufficient to give a ratio of Na_2O to $5\text{B}_2\text{O}_3$. A small excess of soda above this quantity may be present, but not more than 10% of that theoretically necessary.

Antimony sulfide. A. L. STARK. U. S. 1,414,836, May 2. Pptd. Sb_2S_3 is prepd. by mixing finely ground stibnite, S and CaO with sufficient H_2O to form a paste, adding the pasty mixt. to a body of H_2O and heating under pressure to form a double sulfide of Sb and Ca and then adding HCl or H_2SO_4 to ppt. Sb_2S_3 . U. S. 1,414,837 relates to a similar method in which BaO is used instead of CaO.

Cyanides. C. T. THORSELL and H. L. R. LUNDEN. Brit. 175,517, Jan. 19, 1921. Mixts. of alkali or alk. earth metals or their compds. with C, with or without a catalyst, for the production of cyanides by the fixation of N are prepd. in the form of more or less spherical pieces having a hardness of 2 or more. The pieces may be of 1 or 2 cm. diam., and may be dried in a rotary cylinder without crumbling. Cf. C. A. 15, 1108.

Cyanides from gases. M. E. MUELLER. U. S. 1,413,762, Apr. 25. Gases such as coal gas are brought into contact with an alk. soln. contg. a Cu compd., e. g., Cu_2O and Na_2CO_3 , in order to produce $\text{Na}_2\text{Cu}(\text{CN})_2$.

Hydrocyanic acid from gases. M. E. MUELLER. U. S. 1,413,763, Apr. 25. Gases contg. HCN, H_2S , CO_2 and NH_3 are treated with Cu_2S to form a double Cu cyanide which is reacted on with added CuCN. Cu_2S and CO_2 are regenerated and HCN is recovered by distn. with acid.

Potassium values from fumes. J. GAVLEY. U. S. 1,414,353, May 2. Slag tapped off from a blast furnace into a ladle is agitated to promote the evolution of K-bearing fumes and the latter are led to a recovery chamber.

Treating alunite.. F. B. MACCARTHY. U. S. 1,413,045, Apr. 18. Alunite is

heated to a temp. of about 260° with exclusion of air in order to prepare it for leaching to obtain sol. K and Al sulfates.

Calcining and screening gypsum. C. R. BIRDSEY. U. S. 1,412,203, Apr. 11.

Hydrogen and hydrogen-nitrogen mixtures. J. HARGER and WOODCROFT MANUFACTURING Co., LTD. Brit. 175,501, Dec. 30, 1920. In the iron-steam method of mfg. H, producer-gas is used to reduce the Fe_2O_3 , the spent producer-gas being utilized in a gas engine. The exhaust gases from the engine are employed to heat the Fe_2O_3 retorts and to raise steam. To produce mixts. of N and H, a portion of the spent producer-gas is mixed with steam and passed over a catalyst, and the CO and CO_2 are removed in any well known way.

Recovering sulfur gases. M. F. COOLBAUGH. U. S. 1,412,452, Apr. 11. Gases such as smelter stack gases are passed over Fe_2O_3 to form sulfate and the latter is then heated to liberate SO_3 and SO_2 and regenerate Fe_2O_3 .

Collection of sulfur. RINOKICHI KUBO and HAMAJIRÔ ODAIRA. Jap. 38,996, June 22, 1921. A mixt. of S ore and a soln. of $CaCl_2$ of 45° Bé. is boiled at 120°, whereby S collects on the bottom, sepg. from sands and other impurities.

Removing residual oil from alcoholic liquids. M. D. MANN, JR. U. S. 1,413,864, Apr. 25. Sawdust is used to sep. small amts. of oil from alc. liquids such as aq. solns. of *isopropyl alc.*

Regenerating catalyzers. W. D. RICHARDSON. U. S. 1,412,219, Apr. 11. Spent catalyzers such as finely divided Ni are resurfaced mechanically, *e. g.*, by trituration with oil in a ball mill.

Lampblack. J. NELSON. U. S. 1,414,482, May 2. Hydrocarbons which give rise to objectionable volatile decompn. products at 500–700° are cracked at this temp. in the absence of air and the finely divided C produced is collected outside the cracking zone at a temp. of about 400° and treated with a current of innocuous gas in order to sweep away volatile impurities.

Clutches; brakes; plastic compositions. RAYBESTOS Co. Brit. 175,232, Oct. 1, 1920. Relates to a process for making friction facings for clutches and brakes from felted unwoven asbestos fiber, and is a modification of that described in 174,685. By using toluene as the vehicle of the binder therein described, *i. e.*, double-boiled linseed oil, a single satn. of the sheets of felted asbestos and a single baking will suffice. In place of the solid oxidizing agent, which, according to the said prior specification, is mixed with the asbestos pulp, a liquid oxidizing agent, such as Pb or Co resinate, is used.

Brake lining. S. SIMPSON. U. S. 1,414,373, May 2. Unwoven felted asbestos fiber sheets are satd. with mineral oil, gum and bituminous substance, compressed, dried and cured by heating.

Brake lining or friction facing. F. C. STANLEY. U. S. 1,414,383, May 2. Unwoven asbestos fabric is treated with a soln. of gilsonite and linseed oil.

Cementing rubber, leather, etc. S. J. PEACHEY. Brit. 176,073, Nov. 23, 1920. Rubber, leather, etc., are cemented together by a gel of vulcanized rubber, prepd. as described in 129,826 (C. A. 13, 3040) or otherwise. The gel, or the solns. from which it is prepd., is spread over the surfaces to be united, which are then pressed together until the solvent has sufficiently evapd. to ensure adhesion.

Binding paste. SEN-EMON TSUKOSHI. Jap. 38,763, June 1, 1921. It is made of *Ghiopeltis furcata*, glue, Na silicate, $K_2Cr_2O_7$ and an AcOH soln. of litharge or $Pb(AcO)_2$. It is water- and heat-proof and has a strong binding power.

Composition of casein and calcium hydroxide. A. A. DUNHAM. U. S. 1,412,462, Apr. 11. Sol. dry flakes of saline taste are prepd. by quickly drying a soln. of casein 95 and $Ca(OH)_2$ 5%. Cf. C. A. 16, 359.

Protein compositions. W. P. THOMPSON. Brit. 176,035, Sept. 30, 1920. A dispersion of a protein such as hemoglobin, casein, yeast, or fish protein, obtained by high-speed mech. disintegration, is employed as a binding agent, particularly for masses of the same or other proteins. According to an example, 100 parts of dried blood are ground for $1\frac{1}{2}$ -2 hr. in a colloid mill or the like with 500-800 parts of dichlorohydrin when a clear soln. results. 100 parts of this soln. are mixed with 300-500 parts of finely ground hemoglobin, or a mixt. of blood and casein, yeast, etc., and the excess of dichlorohydrin is evapd. at a temp. not exceeding 50°. The mass is ground and molded at a temp. of 80-125° and a pressure of 150-300 atm. The blood mass, or the molded articles can be treated with aldehyde or other tanning agents. Other suitable dispersion media are other aliphatic alcs., especially polyvalent alcs., and phenols, with or without aldehyde. For light-colored articles the untreated protein is dissolved in alkali and pptd. with acid. Kaolin, heavy spar, chalk, talc, etc., may be added to produce an ivory-like appearance.

Vegetable ivory. E. C. LONG. Brit. 175,313, Aug. 13, 1920. Ivory nuts, such as corozo nuts, or waste therefrom, are ground with or without the husk and shell, the mass is heated, e.g., to 80-100° F., and pressed into articles. If desired, binding agents as nitrocellulose of low N content, and coloring matter may be added.

Composition for manufacture of crayons. E. T. HURLEY. U. S. 1,414,570, May 2. A mixt. of animal fat, paraffin, turpentine and pigment.

"Protective gas" from internal-combustion engine exhaust. J. MUCHKA. U. S. 1,413,285, Apr. 18. During the portion of the explosion stroke of the engine when the pressure of the engine gases is high, these gases are led off through a collecting pipe for use as inert gas over stored oil or for other purposes.

Drier for tar-coated surfaces. B. B. LEACH. U. S. 1,413,590, Apr. 25. Alum 1, glue 4 and H₂O 16 parts.

Treating bristles. N. SINGER. U. S. 1,412,755, Apr. 11. Bristles (e. g., low-grade Russian) are successively treated with H₂O soln. and then with a soln. of a hyposulfite in order to effect a permanent bleaching.

Radiator leak-stopping composition. T. DOLAN. U. S. 1,413,524, Apr. 18. Contains graphite, tannin, gum guaiac, Irish moss, "lye," cutch and red oak bark.

Talking-machine record. E. R. HARRIS. U. S. 1,413,984, Apr. 25. Paper-pulp or similar material is mixed with glue, dextrin and shellac and the mixt. molded under pressure.

Treating bark. W. S. H. DOODY. Brit. 175,008, Nov. 1, 1920. The bark of the paper-bark tree (*Melaleuca leucadendron*) is pressed and impregnated with an oily or fatty substance such as a mixt. of 5 parts of paraffin wax and 1 part of resin. It may then be waterproofed by a coating of varnish, collodion, or the like. After having been shaped in the manuf. of various articles it may be covered with thin cloth. The product may be used as material for insoles, inserts for hats and caps, and dress-shields.

Coating composition for imitating bark of trees. A. BUMMARA and S. RAGONHSI. U. S. 1,413,002, Apr. 18. A mixt. of shredded paper 16, glue 8 and colored powd. earths 5 parts.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

An autoclave test for the grading of chemical glassware. W. L. BAILLIE AND F. R. WILSON. *J. Soc. Chem. Ind.* 41, 45-56T(1922).—Contains much exptl. work. Important. Cannot be abstracted.

G. E. BARTON

Historic optical glasses. P. NICOLARDOT. *Le verre* 2, 29-32(1922).

LOUIS NAVIAS

New recuperative pot furnace. W. R. CULBERTSON. *Glass Worker* 41, No. 34, 11, 29(1922).—The Chapman Stein recuperator applied to pot furnaces gives more accurate temp. control. Records from such a 14-pot furnace (each pot holding a batch of 2400 lbs.) which has been in operation in this country for nearly a year also show that from 10-15 more pots per week are obtained from this furnace with about 35% less fuel than from an adjacent regenerative furnace of the same size. J. B. P.

Regarding the accuracy of quantitative chemical analyses. E. SEILCH AND R. GÄSTENAUER. *Spektrsaal* 54, 432-33(1921).—Chem. analyses of ceramic materials are seldom more accurate than 0.01%. H. G. SCHURCHT

The determination of the porosity and resistance of clay ware to acids. O. KALLAUNER AND J. FISER. *Spektrsaal* 54, 421-22(1921).—The results of porosity and acid tests on 25 different ceramic bodies are given as detd. by different methods. H. G. S.

Dry purification of kaolins. ANTI DAHL. *Spektrsaal* 54, 393-6(1922).—The sepn. of graphite by air currents has been highly perfected. Two methods are used: (1) Air or wind separators and (2) centrifugal separators. H. G. SCHURCHT

A noteworthy deposit of kaolin at Neckarsteinach. A. COBENZL. *Chem.-Zig* 46, 334-5(1922).—Describes a new found deposit suitable for the arts, of which an av. of different layers runs: H_2O 8-11, SiO_2 52-60, Al_2O_3 25, Fe_2O_3 0.8-2.0, CaO 0.3-0.6, MgO 0.8-1.3, alkalis 1.2-4.9%. WM. M. CLARK

The use of barium fluoride to prevent scumming. ANON. *Spektrsaal* 54, 547-8(1921).— BaF_2 in place of other Ba salts is cheaper, more sol. than $BaCO_3$, the necessary amt. is the same or less, it does not affect the color of the fired ware, an excess does not cause scumming and it facilitates the vitrification of the mass. H. G. S.

Scumming of whiteware and the peeling off of glazes. ANON. *Spektrsaal* 54, 429(1921).—Peeling is often due to sol. sulfates which are more abundant along the edges than other places. By the use of $BaCl_2$ or $BaCO_3$ the scumming and hence the peeling may be prevented. H. G. SCHURCHT

Scumming, efflorescence and whitewash. ANON. *Brick Clay Record* 60, 602-6(1922).—A review. H. G. S.

Making of stanniferous faience. ALEX. CORNILLE. *Rev. mat. constr. trav. pub.* 150, 35B3-8B(1922).—The body is usually a mixt. of clay, an argillaceous marl, and an argillaceous or calcareous sand. Compn. limits are SiO_2 55-65, Al_2O_3 13-20, Fe_2O_3 2-4, MgO , CaO 13-25, $KNaO$ 2-4%. A CaO content of less than 14% gives rise to cracking, that higher than 22% to scaling and staining. The proportion of CaO is influenced by the content of other bases; i. e., MgO , alkalis and Fe_2O_3 , their presence necessitating a decrease in CaO . Also the higher the temp. of firing the lower should be the CaO content. A glaze corresponding to 0.59 PbO , 0.40 Na_2O , 0.15 Al_2O_3 , 0.26 SnO_2 and 2.45 SiO_2 will stand cone 011. For colored glazes, a mixt. of 1 part of Sn glaze and 4 parts of transparent glaze is used as the base, the coloring oxides being added or fritted to the one or the other as the case may require. The formula of the clear glaze is 0.2 $KNaO$, 0.1 CaO , 0.65 PbO , 0.2 B_2O_3 , 0.1 Al_2O_3 , and 1.1 SiO_2 . A satisfactory clear, tin-less opaque glaze is: 0.8 RO (Pb, Ca, Mg), 0.2 R_2O (K, Na), 0.22 B_2O_3 , 0.07 Al_2O_3 and 2.08 SiO_2 . LOUIS NAVIAS

The preparation and uses of chamotte. A. E. BUCH. *Kalk Gips-u. Schamotte* *Ztg.* 28, 1920-2(1921); *Chimie et industrie* 7, 518(1922). A. F.-C.

Dark colored sewer pipe from fire clay. ANON. *Brick Clay Record* 60, 546(1922).—In making dark colored sewer pipe alternating oxidizing and reducing conditions should be used. A dull black glaze has been made by mixing crude oil with the $NaCl$.

The fire immediately before salting should be clear and bright. After the salting, the kiln should be fired with reducing conditions, and then oxidizing, before salting again.
*H. G. SCHWARTZ

Brick testing by the Brinell ball method of Le Chatelier and Bogitch. GULLAWY. *Rev. mat. constr. trav. pub.* 147, 240(1921).—A ball 17.5 mm. in diam. is sunk into a test brick covered with a leaf of tinsel 0.1 mm. thick, that has been blackened with H_2S . Oblique jamming is prevented by ball bearings. A const. pressure of 500 kg. for 1 min. leaves an imprint in the foil, the diam. of the impression being an index of the resistance. The method is rapid, sensitive and leaves the brick practically unaffected.

LOUIS NAVIAS

Glass. W. C. TAYLOR. U. S. 1,414,715, May 2. A flesh-colored glass of high ultra-violet absorption and good visible transmission is formed with a content of 3-6% CeO_2 and 0.2% MnO_2 , together with SiO_2 , K_2O , Na_2O and CaO . Cf. C. A. 16, 1845.

Compound glass sheets. J. Cox. Brit. 175,044, Nov. 6, 1920. In making compd. glass sheets, the surfaces are treated with a soln. composed of gum mastic, amyl acetate, pyroxylin or collodion, and ricinol oil, dissolved in abs. alc., and superposed sheets are subjected to pressure at a temp. which allows superfluous liquid to escape. When cool, the edges are treated with linseed oil, and the sheets are again heated and pressed; and the edges of the finished sheets are finally sealed with a soln. of shellac in methylated spirit.

Potter's clay. R. L. CAWOOD. U. S. 1,414,254, Apr. 25. A potter's clay having the properties of true kaolin is prepd. by subjecting a natural mixt. of partially and wholly kaolinized feldspar to comminution in H_2O and removing mica and excess H_2O .

Treating clay. W. FELDENHEIMER and W. W. PLOWMAN. Brit. 175,050, Nov. 8, 1920. Clay is deflocculated with the aid of an alkali resinat or its equiv., such as a soln. of a resin acid in one or more alkalis, the preferred reagent being a soln. of common resin in caustic alkali, alkali silicate, or alkali carbonate, or a mixt. of caustic alkali and alkali silicate. The reagent may be applied before or after passing the suspension over mica drags, and also for the deflocculation of an already purified clay. Subsequent pptn. of the clay from the suspension may be effected as described in 121,191 (C. A. 13, 647).

Refractory composition. H. H. BUCKMAN and G. A. PRITCHARD. U. S. 1,412,916, Apr. 18. A material adapted for making retorts, muffles or crucibles is formed of zircon and a refractory clay. Cf. C. A. 15, 2704.

20—CEMENT AND OTHER BUILDING MATERIALS

C. N. WILEY

Homogeneity and the raw materials of cements. JULES DAUTYREBANDE. *Rev. mat. constr. trav. pub.* 149, 25-7(1922).—Foreign materials are added to cements: (A) at the time of grinding the cement. (1) Materials having a chem. action on the cement. Such substances as $CaSO_4$ and $CaCl_2$ are added with the object of regulating the setting of the cement. These materials form Ca sulfoaluminates and chloroaluminates, resp. (2) Materials having only a phys. action on cement. These are inert materials as blast furnace slags put in to modify the qualities of the cement. The result is to slow up the setting, to diminish somewhat the tensile strength and to diminish the sp. gr. of the cement. (B) At the time of mixing the cement for use. (1) Na_2CO_3 accelerates the setting. (2) Materials to make the mortar of the cement impermeable, such as finely

divided calcined clay or slaked lime. *Methods for detecting foreign materials in cements.*—

(1) Boiling water test. The presence of slag is shown by the blue-green color developed on a test piece when held in boiling water, due to Fe sulfide in the slag. S in cement is usually there as the sulfate, which does not give a coloration. (2) Microscopic examn. Slag particles may easily be distinguished by their blue tinge. (3) Flotation in CH_2I_2 mixt. A mixt. of benzene and CH_2I_2 having a d. of 2.93 is prepd. The cement having a d. of about 3.1 settles, while foreign substances as sand, siliceous materials, limestones, chalk and slag will float. (4) Chem. analysis. A sample of cement is screened by a 200-mesh screen, and the finer material is further sepd. by elutriation. The chem. analysis of the finest and coarsest division will show greater differences in compn. than would result from screenings of a sample of pure cement. LOUIS NAVIAS

Cement and its painting. ANON. *Furben-Ztg.* 27, 1652-3(1922).—New cement should be aged before painting. Where this is impossible, the surface should first be washed with H_2O , or dil. H_2SO_4 and then with H_2O , or it may be treated with CO_2 , linseed fatty acids either separately or mixed into the paint, a soln. of $(\text{NH}_4)_2\text{CO}_3$, or of sulfate of Fe, Zn, Mg, or Al. Individual cases may require special treatment.

F. A. WERTZ

Fireproofing wood, paper or textile fabrics. F. C. WHEELER. U. S. 1,414,609, May 2. The material to be fireproofed is boiled for 1 hr. in a soln. formed from H_2O , borax and alum.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

The pulverization of fuels. A. B. HELBIG. *Feuerungstechnik* 10, 114-9, 140-3 (1922).—After giving the principles controlling the powdering of fuel, H. classifies the different kinds of machinery used for the purpose and describes and illustrates a typical machine of each kind. ERNEST W. THIELER

Operating records and construction layouts of plants using the Chance flotation process for preparing coal. D. C. ASHMEAD. *Coal Age* 21, 735-9(1922).—The Chance process for coal flotation utilizes in a machine of special design a mixt. of fine sea sand and water. The max. sp. gr. obtainable with this medium approaches that of the sand itself, while it may diminish to that of water. The app. consists of a cone-shaped vessel contg. the sand-water mixt. which is kept in motion with an agitator making 14 r.p.m. The d. of the fluid necessary for any particular sepp. is regulated by varying the supply of sand and water. Cuts and diagrams of a plant of 2000 ton daily capacity are given.

H. L. OLIN

Low temperature carbonization of coal. N. H. FREHMAN. *Iron Coal Trades Rev.* 104, 574-5(1922).—The system of the British Oil and Fuel Conservation, Ltd. is referred to. It contains the elements necessary for obtaining practical low-carbonizing results, such as continuous operation at temps. automatically controlled, with finely pulverized coal arranged in thin layers and constantly agitated so that every particle receives the same heat treatment, and in sep. stages in sep. chambers whereby, first, the water is removed, second, the coal is transformed from the insol. to the sol. condition (450-650° F.), third, the volatile matter and oils are distd., and then the products are cooled to the desired point. During the transformation period no gas or oil is distd., but after this critical temp. is passed, distn. begins and continues up to the max. crit. low-temp. point, 800° F. After this point high-temp. products are obtained due to the dissociation of the hydrocarbon molecule with freeing of H and deposition of C. J. L. W.

The fusion patent low-temperature retort. C. J. GOODWIN. *Iron Coal Trades Rev.* 104, 574(1922); *Chem. Age* (London) 6, 515-17.—1 fig.—The fusion retort is of the continuous horizontal revolving internally heated type made up of 2 rotating tubes, one of 18 in. diam. and one of 2 ft. 6 in. diam. arranged concentrically around the first tube. Each tube is provided with a special form of breaker for removing the scale and preventing caking of the charge. About 0.1 h.p. is required for operating the breaker in a retort treating an av. of 4.25 tons of coal per day. A practically const. temp. gradient is maintained in the retort up to about 450°, when it remains steady for a few ft. and then falls towards the outlet end as desired. The cost of installation and operation are, resp., about £80 and 1s. 6d. per ton of material treated.

J. L. WILBY

Effect of some physical conditions during carbonization of coal upon the quality of the coke produced. THOS. BRIDGEMAN-SMITH. *Gas World* 76, No. 1972 (Coking Sec.), 10-14(1922).—When ungraded coal is carbonized, the product obtained is more friable than when the coal is uniformly finely pulverized. S. disagrees with the generally accepted theory that the distn. products, during the greater part of the carbonization period, leave the charge at the wallface, and assumes that distn. proceeds inwards with an upward tendency towards the middle of the oven. Investigations made on 2 samples of coal, one dry and the other with 10.5% of water, carbonized under the same conditions, showed that the former produces a coke of much closer grain and of greater crushing strength than the latter. Depreciation of the quality of coke due to moisture is considerable; a good coking coal when dry had a coking index of 21, with 5% moisture 18.5, and with 10% moisture 13. Compression of the charge to 40% reduction in vol. is not beneficial to the quality of coke if 10% or more of water is present, since the improvement due to compression is offset by the effect of the moisture. With poor coking coal, however, the reverse is true, the quality of the coke being increased by about 40%. Also if narrower ovens are used, the av. resultant coke will be better, since the further the distance from the oven wall the greater will be the vol. of gaseous products passing through the mass, and the greater, therefore, will be the porosity of the coke toward the center of the oven. As to speed of carbonization, for poor coals it should be increased so as to lengthen the interval between distn. and solidification of the cementing material to such an extent that all of this is used in coagulating particles of coal. Since higher temps. are needed for this, silica walls could advantageously be installed. Coke from good coking coal can be improved by adding 10-20% of coke breeze.

J. L. WILBY

Low- vs. high-temperature carbonization for production of smokeless fuel. E. R. SUTCLIFFE AND E. C. EVANS. *Iron Coal Trades Rev.* 104, 607(1922).—The combustibility of coke depends not only upon the temp. of carbonization and the proportion of volatile matter but also upon the structure. To obtain a free-burning, smokeless, domestic fuel, is all a question of carbonizing under such conditions that a coke is obtained of a structure and character approaching more nearly that of charcoal than of furnace coke. Such a fuel is obtainable by the Sutcliffe-Evans "Pure Coal Briquette" process which consists in mixing pulverized coal with 20% of pulverized coke breeze and briquetting at a pressure of 10 tons to the sq. in. without use of a hinder, and then carbonizing in any suitable retort or coke oven at a temp. of 600-1000°. These briquets do not expand on coking, have only about 2% volatile matter, are easily ignited, have a structure similar to that of charcoal, and burn with a smokeless flame and a high emission of radiant heat. Low-temp. and high-temp. carbonization for production of smokeless fuel are compared as to yields of by-products and values. No particular advantage is shown for either method; it is a matter depending entirely upon local conditions, due allowance being made for factors such as relative market prices of coal and smokeless fuel and of by-products, character of the fuel obtained in respect to heat value, density, proportion of breeze, and relative costs of plant and operation.

J. L. WILBY

Determination of aromatic hydrocarbons. E. BERL, K. ANDREWS and W. MUELLER. *Am. Gas J.* 116, 440-1 (1922).—See C. A. 15, 2167. J. L. WILEY

Noxious effects of the saline substances in coal for carbonization. M. BORHM. *Gas J.* 158, 206-8 (1922).—B. relates his own experiences and reviews some of the literature in connection with the corrosion of coke-oven walls and tar stills by NaCl and NH₄Cl. The former effect can be avoided by use of silica brick, the latter by removing the NH₃ and NH₄ salts from the tar by treatment in a centrifugal machine. It is of advantage also in removing the H₂O from the tar and thus saving heat in evapn.

J. L. WILEY

Low-temperature carbonization of coal. C. H. LANDER. *Gas J.* 158, 205-6 (1922).—The work of the Fuel Research Board toward development of a low-temp. process, and the importance of the latter as a source of supply of fuel oils are discussed. The industry cannot, however, stand upon the oil production alone as this and the gas amt. to only about 8% of the wt. of the coal carbonized, whereas the coke amts. to 70%. Therefore, since coke can be produced in the form of smokeless fuel suitable for domestic service, the profitable working of a low-temp. process must depend largely upon the recognition by consumers of its superiority to raw coal as a fuel.

J. L. WILEY

Low-temperature carbonization of coal. S. R. ILLINGWORTH. *Iron Coal Trades Rev.* 104, 575 (1922); cf. C. A. 14, 2413.—Coal consists of 4 main types of substances: the *alpha*, *gamma*, *beta* and *ulmin* compds. The *alpha* compd. does not coke, and does not undergo decompn. below 500° and is, therefore, outside the range of low-temp. carbonization. The *gamma* compd. is the cementing ingredient which melts and confers plasticity on a heated coal. It decomposes in 4 stages: below 300°, between 300-350°, 350-400°, and 400-450°, and gives rise to paraffin and naphthnic hydrocarbons. The *beta* compd. has no cementing property and does not melt; on carbonization it gives rise to oxides of C, H₂O, phenol, but little hydrocarbon. Its stability is about the same as for the *gamma* compd. except that type 4 is absent. The *ulmin* compd. gives rise mainly to oxides of C and H₂O. Its presence in bituminous coals is negligible. I. reclassifies coals according to their beta and gamma contents and shows the classification graphically. By this classification coals are divided according to the no. of decompn. stages as governed by their gamma compd. Thus, carbonaceous coals are 1-stage, *m*-bituminous 1-stage tending to 2-stage as C:H ratio decreases, *o*-bituminous 2-stage tending to 3-stage with decrease of C:H ratio, *p*-bituminous 3-stage, and lignitic coals with a C content above 80 4-stage. For obtaining sound, hard, smokeless fuel in low-temp. carbonization, 1-stage coals are most suitable and do not offer the disadvantage of swelling in the retort. These contain only 1 type of the gamma compd. and are decomposed between a short interval of temp., the mass remaining plastic over a great part of the operation. Therefore if the whole of the gamma compd. on the higher stage coals can be destroyed at a low-temp. by a preliminary process, these coals can be made suitable for low-temp. carbonization. I. has accomplished this in the case of over 40 2-stage and 3-stage coals by elimination of the less stable constituents under conditions which are detd. by the analysis of the coal, and a com. plant for operating the process is now under construction.

J. L. WILEY

Some remarks on low-temperature carbonization. H. NIELSEN. *Iron Coal Trades Rev.* 104, 607 (1922).—Low-temp. carbonizing in bulk by means of sensible heat of gases lends itself admirably to practically every fuel proposition. The advantages of the Nielsen retort in this connection are given.

J. L. WILEY

Improved low-temperature by-product recovery gas-producer process. POWERS GAS CORPORATION. *Iron Coal Trades Rev.* 104, 576 (1922).—The Mond gas-producer

has been modified so as to combine the principle of low-temp. carbonization with the original Mond gas process. The process is one of complete gasification in which the volatile matter of the coal is converted into liquid products according to low-temp. methods, and the residual fuel entirely converted into producer gas. The transmission of heat to the raw coal is achieved in a gradual but effective and rapid manner by the use of the sensible heat contained in the hot producer gas evolved in the lower part of the producer without the intervention of retort walls. There are produced per ton of fuel about 115,000-120,000 cu. ft. of producer gas of 178 B. t. u. analyzing CO_2 8.3, CO 21.0, H_2 20.5, CH_4 4.9, N_2 45.3%, 15 to 24 gal. of low-temp. tars, and 90 lbs. of $(\text{NH}_4)_2\text{SO}_4$. The steam required in the process is about 1 lb. per lb. of coal gasified, the whole of which is decomposed. Air and steam superheaters are not required. Installation and maintenance costs are lower than for the original type of plant.

J. L. W.

Economic aspects of low-temperature carbonization. JOHN ROBERTS. *Iron Coal Trades Rev.* 104, 576(1922).—R. reviews his work on blending of coal and coke for avoiding the swelling of coal under carbonization and for producing a strong homogeneous semi-coke (*C. A.* 15, 3382). A second method is to blend coking and non-coking coals so as to produce a compact coke with a fairly high crushing strength. Details of the method will be given later. Cf. *C. A.* 16, 1002.

J. L. WILBY

Maclaurin carbonizing process. ANON. *Gas J.* 158, 325-6; *Chem. Trade J.* 70, 508; *Iron Coal Trades Rev.* 104, 575-6(1922).—This process differs from other low-temp. processes in being independent of all external heating. The plant resembles an elongated gas producer or blast furnace rather than a retort. The coking process and distn. of the oil are done entirely by the hot gases from the lower part of the producer passing upwards through the fuel bed and at the same time being cooled and depositing the oil contents on the cold fuel, the oils being trapped and drawn off without being cracked. The fuel can be made into a smokeless fuel or a hard grey furnace coke or it can be completely gasified. The heat losses are small. The yields per ton of coal are: gas 27731 cu. ft., analyzing CO_2 6.2%, C_2H_2 0.0, O_2 0.6, CO 16.0, CH_4 13.0, H_2 16.1, N_2 48.1, B. t. u. 247; coked residuc 10.96 cwt.; oils 15.6 gal.; NH_3 24 lb. The oils are similar to low temp. oils in the absence of benzene, naphthalene and anthracene, and almost no light oils. The distillates have a high % of phenolic bodies, the lighter distillates contg. about 50% of carbolic cresols and xlenols. The % of big b. p. phenols distg. between 230° and 300° is exceptional. The distillates above 270° contain a large % of solid paraffins. The crude oil is a brown waxy oil which can be used direct as a fuel oil. The ammoniacal liquors are free from ferrocyanides and thiocyanide but contain certain di- or tri-hydroxyphenols which give deep colors when treated with Fe salts. The economic aspects of the process are outlined.

J. L. WILBY

Smokeless fuel for Salt Lake City. G. ST. J. PERROTT AND H. W. CLARK. *Bur. Mines, Repts. of Investigations* No. 2341, 17 pp.(1922).—The problem under investigation was that of smoke abatement in Salt Lake City where the available fuels are Utah bituminous coals of high volatile content, most of which have only mediocre coking properties. It was found after examg. the possibilities of both high- and low-temp. coking that the installation of a plant to supply the entire city with smokeless fuel was not feasible under the present conditions of poor market for by-products unless consumers could be persuaded, by education or legislation, to buy coke at a price of \$3 above that or raw coal. Other possibilities for alleviating the nuisance suggested are (1) sale of available supply of gas-house coke; (2) briquetting of coke breeze from local bee-hive ovens; (3) burning of powd. coal where feasible; (4) installation of a semi-exptl. 100-

ton low-temp. plant; and (5) continuation of the educational campaign to teach proper methods of firing native coals.

H. L. OLIN

The preparation of a flaming fuel from the peat of Les Ponts-de-Martel. FRITZ HINDEN. *Schweiz. Chem. Ztg.* 1922, 157-8.—When this peat is heated to a point below 220° non-inflammable gases are evolved, and the residue burns with a long flame. If heated above this point, an illuminating gas is produced, and a coke remains which much resembles charcoal.

ERNEST W. THIELE

National coal resources. ANON. *Iron Coal Trades Rev.* 104, 674-5 (1922).—A phys. and chem. survey of coal seams of Great Britain by the Fuel Research Board, contg. data on the Yorkshire, Notts and Derbyshire coal field.

J. L. WILEY

Standard methods in sampling, analysis, and classification of coal. A. T. WILLIAMS. *J. Chem. Met. Soc., S. Africa* 22, 155-9 (1922).—A polemical discussion of the original paper (*C. A.* 15, 3899).

W. T. H.

Coal as a chemical raw material. RICHARD LANT. *Technik u. Kultur* 1, 145-8 (1921).—A semi-popular review.

ERNEST W. THIELE

The ignition temperature of coal. RAY W. ARMS. *Univ. Ill. Eng. Expt. Sta., Bull.* 128, 61 pp. (1922).—Ignition temp., which is considered to be the same as glow point, is defined as the temp. at which a coal heated at a uniform rate assumes a uniform glow. Tests were made by heating 35 g. samples in an elec. furnace; temps. were measured by means of a thermocouple. Values range from 440° for a Williamson Co., Ill., coal to 606° for a coke. The glow point is probably affected by the O₂ content of the coal but not by ash and moisture contents, size of particles, slight variations from the normal air supply or by rate of heating. Moreover there appears to be no relation between glow point and liability to heating in storage.

H. L. OLIN

Combustion of South African coals in boiler furnaces. E. P. REIM. *J. Chem. Met. Soc., S. Africa* 22, 117-134 (1922).—Photomicrographs are given and discussed in relation to origin of South African coals; physical changes taking place in coal during combustion; choice of steaming coals; and nature of slag and clinker formed at different temps. R. states that he can det. the suitability of a coal for different purposes, by microscopical examn. of the coal by reflected light similar to metallographic methods, polishing, etching or heat-treating the specimens. The following analyses are given: Witbank coal, ash 17.53, C : H ratio 15.9, B. t. u. 12000; Apex coal, ash 21.00, C : H ratio 15.5, B. t. u. 9000. The high ash content reduces the efficiency of combustion. Boiler tests with these coals are described whereby the steaming efficiency was increased 50% by trebling the combustion space.

W. W. HODGE

Occlusion of gases in coal. A. D. MONRO. *J. Soc. Chem. Ind.* 41, 129-32T (1922).—The gases evolved from New Zealand bituminous, lignite, pitch and brown coals in standing *in vacuo* at ordinary temp. (15-3°) for several days were analyzed. Results showed 3 classes of coals: bituminous with an O/N ratio greater than 0.264 : 1 (the air ratio), lignites O/N ratio 0.264 : 1 (such coals contained little occluded gas) and pitch and brown coals having a small O/N ratio. The rates of evolution of the gases were fairly regular except in 2 cases where "spasmodic bursts" were observed. With coals giving regular results the rate of evolution of N falls more rapidly than do the rates of CO₂ or CH₄. Brown coals appear not to occlude O, but do occlude small vols. of CO₂ and N; while bituminous coals also occlude CH₄. None of the hydrous coals tested evolved any CH₄. Ten different coals were heated to 100°; considerable CH₄ was found in the gases from 4 of the anhyd. coals; the poorer grades of coal gave off a gas of high CO₂ content, up to 97.9% in one case; the pitch coals gave a gas contg. a lower percentage of CO₂; the poorer coals gave off less gas. Evolution of gases from coal was found to be a re-

versible phenomenon. The coal readsorbed the gases, especially the carbonaceous gases, when they were allowed to exert a gas pressure on the coal. Mech. inclusion may account for some of the gases in coal, especially when spasmodic evolution is noted. In general M. considers the gases are present in the coal as a solid soln. The soly. of CO_2 is high, that of O and N low. On this basis he develops an hypothesis to account for the reversibility, evolution-adsorption of gases noted. Six tables of analytical data and a number of references are given.

W. W. HODGE

Boiler room performance and practice of the Colfax Station, Duquesne Light Company. C. W. E. CLARKE. *Mech. Eng.* 44, 295-300(1922).—Fuel and fuel-handling equipment, stokers and clinker grinders, ash-handling and sampling, the piping system, the feed water system, and the boiler plant of 7 B. & W. boilers are described. The design of the plant affords the obtaining of the highest ultimate efficiency in point of fuel, labor and fixed charges. The av. efficiency of the boiler plant for 6 months was 77.5%. Waste heat recovery is not practiced. This is an excellent example of power generation at the coal mine.

J. L. WILBY

Existence of natural gas in Neuengamme near Hamburg. W. HOLTHAUS. *Gas u. Wasserfach* 65, 161-5, 179-82; *J. usines gas* 46, 140-2(1922).—Natural gas was struck in 1910. The analysis showed 91.5% CH_4 , 2.1 C_2H_6 , 1.5 O_2 , 0.3 CO_2 and 4.6 N_2 . A study of the geology of the region is being continued to ascertain the source of the deposit and the prospects for further exploitation.

J. L. WILBY

Recovery and utilization of natural gas. PAUL DAMM. *Z. angew. Chem.* 35, 121-5(1922).—The development of the recovery of natural gas is discussed and data on deposits, production and compn. are given for the world. The U. S. is the chief producing source; small amts. are obtained in Canada, Italy, Hungary, Galicia, Russia, and Germany. Some account is given of its utilization as a fuel, and for the production of gasoline, CH_4 and its compds., and He.

J. L. WILBY

Through horizontal benches of sixes. VERNON BAKER. *Am. Gas J.* 116, 485-8(1922).—A discussion of the installation of through sixes of the Russell Engineering Co. type and of their advantages over the stopped end type. They show a better gas yield and quality, and a much better coke than from stopped end retorts. Heavier charges can be coked with a longer coking time and with a lower labor charge.

J. L. W.

[Gas plant at Leighton Buzzard.] H. G. RUEGGLER. *Gas World* 76, 356-9; *Gas J.* 153, 255-60(1922).—The plant at present consists of horizontal retorts and a carburetted water-gas plant. Gas of 480 B. t. u. is being distributed by mixing 80% of 530 B. t. u. coal gas and 20% 300 B. t. u. water gas. To increase the gas making plant an "Adaptable" vertical retort is being installed. It is designed to carbonize a minimum of 4 tons of coal daily with a production of 18000 cu. ft. of coal gas supplemented by steaming of 450 B. t. u. The plant can be adapted to complete gasification with production of 50,000 cu. ft. of 400 B. t. u. gas. *Naphthalene troubles* are being kept at a minimum on the works by using about 10 gal. per million cu. ft. of gas of "Solvit" in one chamber of the washer; and on the distribution district by intermittent use of a Parkinson vaporizer with paraffin oil as the solvent. Some remarks are made as to purchase of coal by specification.

J. L. WILBY

Graphic charts of gas generator operation. A. W. H. GRIFF. *Am. Gas J.* 116, 435-9, 446-7(1922).—G. shows the advantages to be gained by showing the various operations in gas generators by means of Gibb's triangular charts, (cf. Ostwald, *C. A.* 13, 3305), which, if properly plotted, will show at a glance the various stages of gasification of any fuel, gas constituents, etc. Each of the formulas $\text{C} + \text{O} = \text{CO}$, $\text{C} + \text{H}_2\text{O} = \text{CO}_2$ and $\text{C} + \text{CO}_2 = 2\text{CO}$ is used to designate one corner of the triangular chart.

Any point within the triangle represents, therefore, a gasification process in which any of the 3 cardinal reactions is contained in certain specified proportion, and every point in the chart shows a certain gas of specified constituents. Characteristic examples are given and formulas are developed at some length. The use of the chart is not confined only to gasification processes for detn. of gas combinations, but can also be used to find the conditions under which certain gas combinations are possible, and also according to their volumetric, thermochem. or any other characteristics.

J. L. WILEY

Corrosion of gas meters. ANON. *Gas J.* 158, 384(1922).—Unwashed hydrocarbons, which are used for enrichment of gas by being vaporized into the gas mains, contain tarry and oily ingredients which condense into gelatinous layers in the meter and hinder its operation, or they may become rancid and form fatty acids which attack and destroy the inner coating of the meter. Also the hydrocarbons resulting from the compression of oil gases, and those which contain C_2H_2 , are not suitable to be vaporized with coal gas because C_2H_2 , mercaptans, and the resinous fatty acids attack and quickly destroy the metal of gas meters.

J. L. WILEY

Advantages of low heat unit gas. EDWARD L. RIEKA. *Gas Age-Record* 49, 651-4 (1922).

J. L. WILEY

Electrically operated gate valves. C. E. REESE. *Gas Age-Record* 49, 619-22 (1922); illus.—A discussion is given of power operated valves and a review made of the development of the Dean Control System for the operation of gas, air, steam, water, oil, tar and NH_3 gate valves.

J. L. WILEY

Distribution problems at Bridlington. J. KELLY. *Gas J.* 158, 317-9; *Gas World* 76, 401-3(1922).—To reinforce the inadequate pressure of the gasholders, a turbo-boosters was installed. It furnishes a satisfactory and inexpensive method for maintaining the requisite pressure in the gas mains.

J. L. WILEY

Gas cleaning methods compared. N. H. GELLERT. *Iron Trade Rev.* 70, 1401-6 (1922).—G. analyzes the relative merits of dry and wet cleaning systems for blast furnace gases, giving formulas and tabular data supplying sp. information as to compn., sensible heat, properties, etc. Dry cleaned gas at $400^\circ F.$ contg. 35 grains of moisture per cu. ft. has a greater available heat value by 8.5% than wet-cleaned gas at $70^\circ F.$ and 7.98 grains of moisture per cu. ft. At \$6.00 per ton for coke charged into the furnace, it means a saving of \$0.156 per ton of iron made. There is no difference in flame temp. between the 2 gases.

J. L. WILEY

Carbonization of coal in gas generators. SAMUEL MOORE. *Gas World* 76, 359-62(1922); *Gas J.* 158, 262-5; cf. *C. A.* 14, 333.—The general principles of the Moore gas generator and process are given (cf. *C. A.* 16, 819). A complete plant is not yet in existence, only a modified plant being now in operation. The plant can be operated to produce gas of any desired calorific quality from 190 to 450 B.t.u., and any grade of coke, or complete gasification can be practiced. The quality of the coke is governed by the rate of coal throughput in relation to the temps. used and the physical characteristics of the coal. Working results are not yet available.

J. L. W.

Sampling flue and waste gases. G. INGHAM. *Gas World* 76, No. 1972 (Coking Sec.), 9 (1922).—Results of tests substantiate those made by Edwards (*C. A.* 16, 1851) on use of Fe tubes for taking samples.

J. L. WILEY

Practical interpretation of automatically recorded volumetric percentages of carbon dioxide in flue gases. W. E. APPLEBY. *Chem. Eng. Mining Rev.* 14, 156-60(1922).—A flue-gas delator (alignment chart) is developed and illustrated. By the alignment of the values representing the vol. of CO_2 in the flue gas as read from an automatic CO_2

recorder and the difference in temp. between the atmosphere and the exit gas, the heat value wasted is read directly. LOUIS JORDAN

The recovery of combustible material from ashes. PRADRL. *Feuerungstechnik* 10, 151-3(1922).—P. describes 2 new machines for this purpose. One depends on electromagnetic sepn., the other on sepn. by a heavy soln. or suspension. ERNEST W. THIELKE

Some simplified formulas for excess air. JOHANN AGTHE. *Feuerungstechnik* 10, 113-4(1922).—Refers to the combustion of gases only. ERNEST W. THIELKE

Gas-fired steam plant. R. L. ELLIS. *Power* 53, 472-4(1921); *Science Abstracts* 24B, 323-4.—Gives particulars of tests on a plant of eight 6000-sq. ft. Stirling boilers with superheaters at the Sloss Sheffield Steel and Iron Co.'s works, North Birmingham, Ala. Six boilers are gas-fired, Birkholtz-Terbeck burners, 8 per boiler; two boilers burn coal dust on Coxse stokers. Gas is fed to the furnaces through a Venturi meter. An av. of the daily gas analysis over several months gave the following results: Vol., CO 4.2, H 53.1, CH₄ 32.2, C₂H₆ 1.6, O 0.2, CO₂ 1.0, N 7.7% = 100; wt., CO 11.10, H 10.15, CH₄ 49.26, C₂H₆ 4.24, O 0.60, CO₂ 4.19, N 20.46% = 100. With perfect combustion 9.7% is the max. content of CO₂ in the flue gases, and one vol. of gas requires 4.68 vols. of air for complete combustion. The losses are calcd. as follows: (1) Due to moisture, 0.15%; (2) due to formation of H₂O, 14.19%; (3) due to heat wasted in dry flue gases, 6.66%; (4) due to radiation and moisture in gas—only small, and together taken to be 5%. The total loss is then 26%. Curves were constructed between (a) excess air and CO₂, and (b) excess air and O; and from these two an efficiency curve on a CO₂-content base can be obtained for operating the plant at max. efficiency. The following averages were maintained over a period of several days:

Boiler-room temp.	70° F.	Gas heat value, B. t. u.	530
Uptake temp.	475	" " " (analysis) ...	535
Gas temp.	110	Total gas used, cu. ft.	7,365,400
Gas and air temp. (at burner)	72	Total steam, lbs.	2,511,600
Feed-water temp.	185	Lbs. steam per cu. ft. gas	0.341
Superheat.	120 deg. F.	Equiv. evapn., lbs. per cu. ft. gas	0.3976
Factor of evaporation ...	1.169	Efficiency, %	72.8
The av. analysis of flue gases was: Vol., CO 0.05, CO ₂ 7.75, O 3.75, N 83.45%; wt., CO 11.05, CO ₂ 11.61, O 4.08, N 84.26%.			
H. G.			

Motor truck operating on producer gas. AUCLAIR. *Bull. officiel direction recherches sci. ind. inventions* 3, 141-53(1922).—The producer consists of a sheet metal cylindrical shell, 490 mm. in diam. by nearly 2 m. high. The upper half serves as fuel hopper, while the lower half has a double sheet metal wall, with a refractory lining. It is provided with a cover, surmounted by a chimney which can also be covered. Air inlets are provided around the shell at 3 different heights, and are provided with bell-shaped closures which can be operated from the outside. The purifier consists of 3 medium-sized, parallel, cylindrical pipes, provided, at intervals, with boxes (common to the three), which serve as settling chambers for the dust. Chipped or waste wood and 2nd grade wood charcoal are burned. The producer was set up on a 20 h. p., 1,160 r.p.m. motor truck; and the only change in adjustment was to time the spark 20 mm. earlier (30 instead of 10 mm.). The truck was used for several weeks for regular suburban traffic, and then made a 189 km. run (Vierzon to Paris) during which all conditions were carefully controlled. The equipment was found remarkably reliable. The fuel consumption was 0.168 kg. per ton per km. (total 191.25 kg.) and 1.6 l. of gasoline. A careful examn. of the motor at the end of the run showed absence of tar and satisfactory removal

of the dust from the gas. The greatest advantage is that the producer can be adapted to existing trucks and tractors with practically no change, so that they can be run on gas or gasoline or both at a moment's notice.

A. P.-C.

A comparison between stationary and mechanical producers. A. L. CULBERTSON. *Nat. Glass Budget* 38, No. 3, 22-6(1922).—A detailed account of the Chapman floating agitator. The m. p. of the ash of gas coals is usually within the limits of 1900-2800° F. Corresponding to these temps. the blast temp. necessary to prevent clinkering in the producer varies from 148° to 108° F.

J. B. PATCH

The south-Russian benzene industry. L. LATINSKY. *Chem. App.* 9, 69-72; *Feuerungstechnik* 10, 137-40(1922).—A brief review of the development of the by-products coke-oven industry, with 4 cuts and descriptions of the app. used in benzene recovery, and 4 charts showing the % compn. of the crude benzene on distn.

J. H. M.

American coking practice. The Roberts process. H. V. PATTERSON. *Iron Coal Trades Rev.* 104, 570-3(1922). Cf. Lee and Hebden, *C. A.* 16, 1657.—Detailed description of the Roberts oven and process together with results of blast-furnace operation with the coke therefrom.

J. L. WILEY

Use of coke-oven gas for town supply at Middlesbrough. C. F. BLINCOE. *Gas World* 76, 378-9, 406-7; *Gas J.* 158, 322-3(1922).—The rich gas from a battery of 46 Otto regenerative ovens is used for town gas, the lean gas being used for heating the ovens. Particulars of the purification and distribution are given. The economic aspect is emphasized.

J. L. WILEY

Preparation of road tar in gasworks. S. A. WIKNER. *Gas J.* 158, 319-22; *Gas World* 76, 403-6(1922).—The most suitable process for dehydration of tar is the continuous distn. process. Several standard types are already well known (West, *C. A.* 16, 155, and Chambers, *C. A.* 16, 1310). For heating, coke breeze is more economical than gas; the difference in cost is considerable, and the saving will more than pay for the extra labor, cost of furnaces and upkeep. Difficulty is found, even in well equipped tar works, in working distn. plants so as to produce prep'd. tar which meets the specifications of the Road Board. It is usually necessary to distil nearly to pitch and cut back with the required mixt. of anthracene oils and creosote. Beyond verifying the source of the tar, a limitation on sp. gr., % of H₂O, and consistency is all that should be necessary to produce a material satisfactory in every way for road use. W. describes a method of dehydration by means of steam which has attractive features, is economical of fuel, and from certain kinds of crude tar produces an excellent product for road-making purposes. The consumption of breeze for steam raising is put at 40 lb. per ton of tar, or 3 d. for fuel cost. The system will dehydrate tar containing 15% of water and yields 3 gal. of crude naphtha in addition. Attractive features are removal of fire risks and of frothing, and the small amt. of corrosion.

J. L. WILEY

Coke-oven gas for town's use. T. NICHOLSON. *Gas J.* 158, 269-70, 327-8; *Gas World*, 76, No. 1972 (Coking Sec.) 14-18(1922).—After purification, a gas of 478-9 B. t. u. and contg. 15.17% inerts is supplied from a plant of 120 Smet-Solvay waste-heat ovens.

J. L. WILEY

Coking quality of a coal defined. I. Carbonization of mixed coals. II. Low temperature carbonization. III. Wm. E. DAVIES. *Gas Age-Record* 49, 163-4, 303-5, 593-6, 597-600(1922).—See *C. A.* 16, 821, 1001, 1308.

J. L. WILEY

Purple of Cassius found in bomb washings (BOLLING) 1. Coal at Amberg (KUPFER) 8. Determination of pore space of oil and gas sands (MELCHER) 8. Determining

sulfur in organic compounds (MEULEN) 7. The origin of coal (URBASCH, *et al.*) 8. Origin and chemical structure of coal (FISCHER, SCHRADER) 8. Subterranean gasification of lignites (LANZA) 8. Reactions in gas generators (JÜPTNER) 2. Some constituents of lignites (CIUSA, CROCK) 10. The acids of montan wax (TROPSCH, KREUZER) 10. The structure and formation of humic acids and coals (MARCUSSE) 10. The hydrogenation of naphthalene (FURNESS) 10. Purifying waste liquids (Brit. pat. 175,285) 14. Treating gases with liquids (Brit. pat. 175,649) 13. Cyanides and HCN from gases (U. S. pat. 1,413,762-3) 18.

EGGERER, G. W.: *Kohle und Kohlen-Ersatz*. Leipzig and Berlin: B. G. Teubner. M 12.

Gas Chemist's Handbook. 2nd Ed. New York: Am. Gas Assoc. 586 pp. \$6.00. Reviewed in *J. Frank. Inst.* 193, 723(1922).

MOORE, ELWOOD S.: *Coal: Its Properties, Analysis, Classification, Geology, Extraction, Uses and Distribution*. New York: John Wiley & Sons. 462 pp. \$5.

Drying coal. T. A. GOSKAR. Brit. 175,674, Oct. 1, 1920. Powd. coal and like granular material in a porous and downwardly diverging column is dried by being subjected to the effects of induced currents of heating and cooling air or gases, the air or gases being a common supply to the whole of the column. A suitable construction is specified.

Peat. H. A. MUELLER. Brit. 175,978, Feb. 20, 1922. See Can. 217,134 (C. A. 16, 1858).

Stick-like fragments of peat for fuel. F. T. DOW. U. S. 1,414,344, May 2.

Motor fuel. C. ELLIS. U. S. 1,412,233, Apr. 11. Wet alc. obtained by the hydrolysis of the H_2SO_4 ext. from still gas is mixed with C_4H_{10} ; H_2O and dil. isopropyl alc. are sepd. and gasoline is added to the C_4H_{10} propyl alc. mixt.

Motor fuel ("gasoline substitute"). E. W. STEVENS. U. S. 1,414,750, May 2. A petroleum distillate such as kerosene or gas oil 75, is mixed with alc. 15, toluene 5 and Me or Et formate 5 parts. Cf. C. A. 15, 4046.

Apparatus for complete combustion. TATSUZO FUJITA. Jap. 39,030, June 25, 1921. Diagrammatical description. A cylinder made of wire gauze and asbestos plate is rotated in an engine for complete combustion.

Liquid-fuel burners. F. HARDINGE. Brit. 175,673, Sept. 17, 1920. In a rotary burner consuming crude and residual fuel oils, the fuel oil is sepd. from its impurities and the impurities are agitated to prevent their being deposited in the burner nozzle. A suitable construction is specified.

Gas producer. H. G. JOHNSTON. U. S. 1,412,118, Apr. 11.

Gas producer. W. B. CHAPMAN. U. S. 1,412,921, Apr. 18.

Gas producer. F. M. E. BLASS. U. S. 1,414,109, Apr. 25.

Device for selective absorption from gas in transmission lines. F. F. UHRLING. U. S. 1,412,790, Apr. 11.

By-products from coal gas. A. MITTASCH, J. JANNEK and G. WIEZEL. U. S. 1,412,954, Apr. 18. Gas freed from tar and CN compds. is passed through active charcoal, benzene hydrocarbons are removed and the gas is then mixed with sufficient air to oxidize the H_2S and produce free S which is pptd. After this treatment, C_4H_{10} is removed and the charcoal is revived as required.

Recovering ammonia and tar from gases. C. H. SMITH. U. S. 1,413,769, Apr. 25.

Finely divided coal is subjected to distn. at a temp. below that at which much NH_3 is produced; while agitated, vapors are continuously withdrawn and the residue is treated at a higher temp. in a by-product gas producer and the NH_3 thus formed is recovered.

Pyridine from ammonium sulfate solutions. F. W. SPEAR, JR. and R. L. BROWN. U. S. 1,414,441, May 2. Acid-satd. $(\text{NH}_4)_2\text{SO}_4$ solns. contg. pyridine are subjected to steam distn. to recover the pyridine.

Destructive distillation of coal. P. FARUP. U. S. 1,414,401, May 2. Coal or similar material is distd. by first heating electrically by indirect radiation and then by direct heating.

Retort adapted for coal distillation. C. H. SMITH. U. S. 1,413,801, Apr. 25.

Retort adapted for coal distillation. C. H. SMITH and E. B. EDWARDS. U. S. 1,413,802, Apr. 25.

Retort adapted for carbonizing coal. W. B. HEDDISON and H. S. OWENS. U. S. 1,413,838, Apr. 25.

Furnace retort for carbonizing coal. C. H. SMITH. U. S. 1,414,159, Apr. 25.

Heat treatment of coal. C. H. SMITH. U. S. 1,414,223, Apr. 25. Coal is heated to 440–650° for 1 hr. while agitated and the partially distd. residue is quenched and crushed.

Vertical retorts adapted for coking coal. J. PIETERS. U. S. 1,412,628–9, Apr. 11.

Metallurgical coke. ENCHU TATSUMI and MITSUI KOZAN KABUSHIKI KAISHA. Jap. 38,726, May 26, 1921. Coke for smelting is manufd. from a mixt. of coal and coke, produced by dry distn. of coal at low temp. A mixt. of coal 100 and powd. coke 20–45 contg. 8–15% volatile matter is charged in a coke oven and the coking conducted as usual. The product is hard and has a homogeneous and moderate porosity.

Coking. S. R. ILLINGWORTH. Brit. 175,888, Feb. 2, 1921. Addn. to 164,104. Coal is preheated at a temp. not exceeding 500° as described in the principal patent, and the product is crushed, if necessary, and carbonized at a temp. not exceeding 600°. The resulting semi-coke may be further carbonized at higher temps., e. g., 900°. The coal is preferably preheated in thin layers, and under mech. agitation; temps. of 350° and 400° are specified. Cf. C. A. 16, 1312.

Coking coal. A. ROBERTS. Brit. 175,319, Aug. 21, 1920. Heat is introduced into the mass of the coal so rapidly that the temp. is raised to the temp. of decompn. of the resinous content of the coal (600–750°) before excessive oxidation or distn. of the resinous content occurs, whereby the latter is decompd. to form the cementing or binding material necessary for the production of metallurgical coke. A suitable retort for carrying out this process has a relatively large mass compared to the mass of the charge, and a relatively large area for the transmission of heat to the charge and for absorbing heat from the heating flues. The retort may have a relatively narrow charge-contg. space and may be, in consequence, extended in length.

Coke ovens. SOC. DES FOURS A COKE SEMET-SOLVAY ET PIETRE. Brit. 175,902, March 1, 1921. In a coke oven of the type described in 127,165, gas with excess air is delivered at the base of the flues in one half of the heating wall through the usual ports, and an additional supply of gas is admitted to the horizontal connecting flue in the other half of the wall. A secondary combustion is thus effected in the downcast flues, and the products are delivered to the regenerators without any excess of uncombined O.

Carbonizing processes. C. H. MERZ and W. McLELLAN (trading as Merz & McLeffan), W. T. BORROMLEY and E. G. WREKS. Brit. 176,149, Dec. 3, 1920. In the low-temp. distn. of fuel with superheated steam, bleed or exhaust steam from a steam power unit is passed through heat exchangers in which make-up water is evapd.

and the steam produced utilized in a low-temp. distn. app. A suitable app. is specified. Cf. C. A. 16, 1145.

Carbonizing. G. P. LEWIS. Brit. 175,670, Aug. 31, 1920. Carbonaceous materials such as lignite, brown coal, and peat are powdered, mixed to form a paste with a hydrocarbon such as creosote, and so ground to colloidal dimensions, the mass being then ground with coal tar or the like to form a liquid as described in 172,065 (C. A. 16, 1145). This colloidal liquid is passed under a pressure not exceeding 25 atms. through piping of small bore heated to not exceeding 500° and is injected into a chamber in which vaporization takes place. The vapors are condensed and the permanent gas sep'd., leaving a liquid which may be used for fuel or may be further vaporized in the chamber, a semi-liquid mass remaining which is suitable as a binder for briquets, or on still further vaporization, a residue from which briquets are formed is obtained. These briquets may be distd. to produce gas, coke, etc., or may be used in a gas producer. Lime may be added prior to the treatment if the material possesses acid properties and to avoid clogging in the retort, boric compds. may be added before carbonizing.

22—PETROLEUM, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Galicia and its petroleum industry. A. MILLAR. *Petroleum Times* 7, 511-12 (1922).—A general description of the Galician fields, particularly of the largest, the Boryslaw-Tustanowice-Mraznica field.
R. L. SMILEY

Thermal problems of petroleum refining. L. A. MEXLER. *Chem. Met. Eng.* 26, 774-8 (1922).—The efficiency of conventional stills is about 20% as compared to 75 to 80% for a modern boiler. A still should heat the oil evenly, and at a rate such that local overheating will not occur. Heat transfer phenomena are briefly discussed. Countercurrent flow of hot flue gas and oil, and high fluid velocities are essential if the highest rate of heat transfer is to be obtained. For this reason the pipe-coil still is better than the tubular-still. The elementary principles of combustion in furnaces are discussed. Tables or charts are given showing the air required for burning various fuels, loss of heat if combustion is incomplete, effect of excess air on combustion efficiency, importance of proper mixing of air and fuel, and for the relationship of combustion space and max. temp. obtainable. The beneficial effect of "recirculation" of partly burned gases of combustion is discussed. A chart is given showing the relationship between mol. wt. and b. p., mean sp. heat, sp. gr., and latent heat of vaporization of the paraffin hydrocarbons.
R. H. LESLIE

Evaporation loss of petroleum in the Mid-Continent field. J. H. WIGGINS. *Bur. Mines, Bull.* No. 200, 115 pp. (1922).—The evapn. losses during handling and storing before the refining operations are relatively large under av. conditions. A large part of the loss can be avoided by the adoption of methods whose costs are saved in a short time. Since the most valuable fraction, naphtha, evaps. most readily, the economic % loss is 2 to 3 times the vol. % loss. Dehydration in open tanks by passing the oil up through heated water causes the most extensive loss by evapn. The "breathing" of storage tanks, due to the change of the temp. of the gasoline-laden air above the oil, causes serious losses. Overshot delivery pipes should not be used in storage tanks. Under a given set of conditions, the loss by evapn. of naphtha from a crude oil is 50 to 60% of the loss suffered by the naphtha itself. The rates of evapn. of the crude and the naphtha are the more nearly the same, the more volatile the naphtha yielded by the crude.
W. F. FARAGHER

Detecting small quantities of petroleum. E. T. ERICKSON. *Eng. Mining J.* 112,

50-62(1921).—The methods described are essentially for field work and cover the obtaining and prepn. of the sample as well as its examn. Heating in a test-tube or extn. with CHCl_3 or CCl_4 form the basis of the methods. The heat test applies to all materials from which oil can be obtained, while the soln. tests are only conclusive when free petroleum, etc., are concerned.

D. K. FRENCH

Investigation into the physico-chemical significance of flash-point temperatures. W. R. ORMANDY AND E. C. CRAVEN. *J. Inst. Petroleum Tech.* 8, 145-80; *Engineering* 113, 80-1(1922).—See *C. A.* 16, 1147.

E. J. C.

Australian oil shale industry. D. A. FELL. *Nat. Petroleum News* 14, No. 18, 89, 90, 93(1922).—In the Fell process, shale is crushed in gyratory rock breakers and delivered to vertical retorts at the top hopper; it works through into the bottom hopper by gravity. Steam is introduced into the retort at the point where the shale attains its greatest temp. Three products are obtained: a crude oil, crude naphtha recovered by means of scrubber towers and ammoniacal liquor.

R. L. SMILEY

Recent oil shale developments. J. T. NORMAN. *Petroleum Times* 7, 477-8(1922).—The Estonian fields are briefly described.

R. L. SMILEY

Distilling oil shales without retorts. ANON. *Petroleum Times* 7, 510(1922).—Sections of the shale beds are blocked out and bricked in and sufficient air is supplied to maintain the desired rate of combustion, which supply is under regulation and therefore controls the burning of the shale. Early trials are stated to have been successful and it is stated that oil was given off in abundance as well as a large quantity of gas which was suitable for generating power. The shale is of exceptional richness, yielding from 100-150 gallons oil per ton of shale. The possibility of using this method is presumably limited to cases where the shales are exceptionally rich in org. matter and for material such as cannel coal and torbanite.

R. L. SMILEY

A study of Texas crudes. ANON. *Petroleum Age* 9, No. 10, 16, 17, 80(1922).—A general consideration of the characteristics of North and South Texas crudes. The phys. tests of finished lubricating oils from Coastal crudes differ considerably when compared with products from North Texas crude and many chem. structures are at quite a variance also. Thus, of 2 oils having the same viscosities, the following differences are noted: Coastal crude, gravity low, flash low, cold test low. Paraffin crude, gravity high, flash high, cold test high.

R. L. SMILEY

Manufacture of lubricating oil. ANON. *Petroleum Times* 7, 478(1922).—A new German lubricant "Volltol" is prepared from kerosene. A closed horizontal boiler of 900 cu. ft. capacity has a rotating central axle carrying 4 electrodes to which scoops are attached. When the axle is rotated, these scoops lift the oil from the lower part of the cylinder and pour it through the spaces between the electrodes which are insulated from each other. Alternating current of 19 to 23 amps. and of 4500 v. is used. Oil is run into the boiler until it reaches the lowest electrode and is then heated to 60-80°. A pressure of 60 cm. Hg is established and the air displaced by H. The axle is then revolved and the elec. discharge started. Hydrogenation takes place. The product has a high viscosity but is comparatively liquid at low temps.

R. L. SMILEY

Determination of pore space of oil and gas sands (MELCHER) 8. Geology of oil (DOLMAGE) 8. Determining S in organic compounds (MEULLEN) 7. The origin of petroleum (HÖPER) 8. Centrifugal separators (Brit. pat. 175,121) 1. Distilling oils, etc. (U. S. pat. 1,414,465) 13.

MITZAKIS, MARCEL: *The Oil Encyclopedia*. London: Chapman and Hall, Ltd. 21s. Reviewed in *Engineering* 113, 499(1922).

Hydrocarbon oils. NIPPON GLYCERINE KOGYO KABUSHIKI KAISHA. Brit. 175,974, Feb. 16, 1922. Hydrocarbon oils are obtained by the dry distn. at atm. pressure of alkali, alk. earth, or metal soaps. Ketones, aldehydes, and gas suitable for fuel purposes also pass over, and metal oxides or carbonates remain. It is preferred to use the soda soaps, with or without excess of alkali, e. g., the residues from the alkali refining of fish oil or soya bean oil. Examples are given of the distn. at 400–550° of soaps made from soda and fish oil, soda and tallow, lime and tallow, and Zn and tallow, Fe retorts being used. Potash and Mg soaps are also specified. The proportion of light hydrocarbons may be increased by mixing Fe or Ni scraps, or a metallic oxide or chloride, such as Fe_2O_3 , Ni oxide, or AlCl_3 , with the soaps to act as catalyzers during the distn.

Refining hydrocarbon oils. E. M. CLARK. U. S. 1,413,899, Apr. 25. Petroleum oil and hydrocarbon gas are simultaneously refined by passing the oil under pressure from the gas through reagents such as acids and washing solns.

Electric apparatus for dehydrating oil. S. A. GIEBNER. U. S. 1,414,079, Apr. 25.

Desulfurizing petroleum. E. B. COBB. U. S. 1,413,005, Apr. 18. Hydrocarbon oil contg. free S and H_2S is treated with NaOH soln. to convert the H_2S into alk. sulfide and the latter is allowed to react upon the free S at 70–90° to form a separable sulfide sludge. Cf. C. A. 15, 311.

Distilling petroleum oils. F. A. KORMANN. U. S. reissue 15,337, Apr. 18. See original pat. No. 1,332,849 (C. A. 14, 1215).

Petroleum distillation. E. M. CLARK. U. S. 1,413,260, Apr. 18. The crude oil is distd. until a residuum of the consistency of a pitch of high m. p. is obtained and the hot molten residuum is mixed with a heavy petroleum oil of low viscosity such as heavy pressure tar distillate to produce a fuel blend which is fluid at ordinary atm. temps.

Distilling oils, etc. P. MATHER. Brit. 175,666, Aug. 18, 1920. In the fractional distn. of crude or topped oils or other liquids, the liquid flows down a vertical cylindrical still through helically arranged compartments formed between an outer furnace-heated casing and an inner vapor-receiving casing. A suitable construction is specified.

Distilling and decomposing hydrocarbons. CANADIAN AMERICAN FINANCE & TRADING CO., LTD. Brit. 174,965, Aug. 9, 1920. In the process for distg. hydrocarbons described in 169,763, in which all or nearly all the heat required for vaporization is provided by mixing the hydrocarbon with a fluid such as superheated steam, more heat than is necessary for vaporization may be supplied, either between various stages in which condensation takes place, or before condensation, or both, the pressure and temp. at which the fluid is supplied being regulated so as to control the resulting products. The heated vapor may also be expanded to allow solids to deposit, and may be filtered from them. If superheated steam is used it should be at such temps. and in such quantities that the hydrocarbons are not oxidized, the invention being thus distinguished from that set forth in 158,337 (C. A. 15, 1986) and 159,802. App. is described for applying the process to Alberta tar sands.

Cracking hydrocarbon oils. V. L. EMERSON. U. S. 1,414,400, May 2. Heavy hydrocarbon oil is distd. under pressure and the gaseous products of distn. are progressively sep'd. by condensation at successively lower temps. A portion of the condensates is subjected to heat interchange with the freshly formed gaseous products of the distn. by intimate contact; fresh oil is mixed with these condensates and the resulting mixt.

is returned into the material undergoing pressure distn. Light condensates are withdrawn. Cf. C. A. 15, 1073.

Apparatus for cracking hydrocarbon oils. J. NELSON. U. S. 1,412,540, Apr. 11. Cf. C. A. 16, 339.

Apparatus for cracking hydrocarbon oils. H. A. DREFFHIN. U. S. 1,413,327, Apr. 18.

Lubricating oil. G. D. HARPER. U. S. 1,414,895, May 2. Crude petroleum of the grade of Franklin heavy oil and having a naphthene base is concd. by distn. to about 70% of its original vol. and then filtered to obtain a lubricating oil adapted for use in internal-combustion engines.

Drying wood. K. FUJINO. U. S. 1,413,018, Apr. 18. The wood is subjected to the action of the sol. and volatile products derived from carbonizing green wood. The process is suitable for producing lumber of good quality.

23—CELLULOSE AND PAPER

CLARENCE J. WEST

Problems of cellulose chemistry. E. HEUSER. *Paper* 29, No. 23, 7-10(1922); *Pulp Paper Mag. Can.* 20, 389-91(1922).—See C. A. 16, 827. H. H. HARRISON

The constitution of cellulose. KURT HESS. *Paper* 27, No. 13, 13-17; No. 14, 22-6; No. 15, 20-22(1920).—See C. A. 15, 1619. H. H. HARRISON

Hydrolysis of cellulose. YRJÖ KAUKO. *Naturwissenschaften* 9, 237-8(1921).—By satg. moist cellulose with HCl in the cold, a thick soln. is obtained which remains almost colorless even after 40 hrs. The soln. thus obtained reacts with Fehling soln. to the extent of 40-60% of the theoretical amt. of dextrose, if complete transformation were assumed. With increasing time of reaction, increasing amts. of substances giving dextrose after autoclaving are formed. As much as 90% of dextrose may be obtained if sufficient time be allowed for the reaction. At 13°, 80% is obtained within 4 hrs. Above this temp., dark colored products are obtained. The yield of dextrose is markedly increased by moistening the cellulose with larger quantities of water. A quant. method for the estn. of cellulose might be developed, this reaction being used. J. C. S.

Determination of alpha-, beta-, and gamma-cellulose. OFFERMANN. *Paper* 28, No. 14, 19-25(1921).—The cellulose content of the pulp is detd. as follows: 10 g. of pulp are covered with 50 cc. mercerizing liquid (17-18% NaOH) and allowed to stand for 30 min. The fiber mass is then rubbed with 50 cc. of water, filtered on a Buchner funnel with a fine cotton filter, and carefully sucked dry. The residue is washed with cold water until the wash water no longer has an alk. reaction; this usually requires 10 to 12 washings, 50 cc. of water being used each time. Finally the α -cellulose is washed with dil. hot AcOH, then with bot H₂O (6 to 8 times), dried and weighed. β -Cellulose is detd. by adding concd. AcOH to the alk. filtrate until a marked acid reaction is produced, when β -cellulose seps. in a finely divided state, while the color of the brown filtrate becomes considerably lighter. To assist coagulation, the ppt. is heated on the water bath at 100° until it settles clear. This is filtered on a fine cloth filter, washed 6-8 times with hot water, transferred to a porcelain dish, dried and weighed. γ -Cellulose is detd. by difference. H. H. HARRISON

Detection and determination of free sulfuric acid and of sulfoacetate in cellulose acetate. M. ENTAT AND E. VULQUIN. *Ann. chim. anal. chim. appl.* [2] 4, 131-5 (1922).—Cellulose sulfoacetates are mixed esters, the chem. constitution of which has

not yet been definitely established, but of which there seem to be 3 contg. 5, 10 and 25% combined H_2SO_4 , resp. They are not plastic and are unstable, decomp. spontaneously with liberation of H_2SO_4 , which saponifies the acetate and liberates $AcOH$. Extn. of the cellulose acetate with water dissolves part of the sulfoesters, but also the alk.-earth sulfates from the wash waters; so that pptn. with $BaCl_2$ gives unreliable results, both qualitatively and quantitatively. E. and V. obtain the true H_2SO_4 content by electro-metric titration with $Ba(OH)_2$ by means of a rotating H electrode. Eastman, Bayer von Heyden, A. G. F. A., Verein usines du Rhône, Dreyfus, and Clément-Rivière cellulose acetates were tested. For free H_2SO_4 , 10 g. were digested with 200 cc. of distd. water below 15° for half an hr., filtered, and titrated. None was found in any of the samples. For sulfoacetate, 10 g. were hydrolyzed for 5 hrs. at $125-150^\circ$ with 50 cc. distd. water, filtered, washed, and titrated. The A. G. F. A. sample was free from sulfoacetate, which was to be expected, as their patent covers the use of Br as catalyst. The other samples yielded 0.0045-0.0327% H_2SO_4 . The sulfoacetate present in properly prepd. cellulose acetate is probably that contg. about 5% H_2SO_4 , so that well prepd. com. cellulose acetates should always contain less than 0.60% of sulfoacetate.

A. P.-C.

The "baryta resistance" of pulps. CARL G. SCHWALBE AND HERMANN WENZL. *Zellstoff u. Papier* 2, 75-80(1922).—The "baryta resistance" of pulps is detd. by boiling 3 g. air-dried pulp with 200 cc. cold satd. $Ba(OH)_2$ for 1 hr., washing onto a gooch with hot H_2O , and then washing with HCl until the filtrate is Ba free. The wt. of cellulose is corrected for ash. There is a slight decrease in the pentosan content by this treatment. The lignin content is not changed in a Ritter-Kellner pulp but is considerably decreased in a Mitscherlich pulp. This may be a characteristic difference in the 2 pulps. There is some decrease in the Cu no. Results of the comparative detn. of α -cellulose and the "baryta resistance" indicate that the latter is a valuable figure which, however, cannot replace the detn. of the former but supplements it.

C. J. WEST

Determination of sulfurous acid and lime in sulfite liquors. B. DEUTSCH. *Zellstoff u. Papier* 2, 56-60(1922); *Paper Trade J.* 74, No. 20, 49-50(1922).—After a general discussion of the advantages and disadvantages of the several proposed methods, it is concluded that the only safe methods are those of Sanders and the pptn. of Ca as the oxalate. For rapid and approx. analysis the method of Winkler-Höhn may be used.

C. J. WEST

Modern fresh liquor preparation. HUGO LAUBER. *Zellstoff u. Papier* 2, 86-9(1922).—Brief description of various ovens for burning S and app. for washing and absorbing the gases.

C. J. WEST

Towers. ANTON D. J. KUHN. *Zellstoff u. Papier* 2, 89-91(1922).—Comparison of the single and multiple tower systems.

C. J. WEST

Determination of the chlorine consumption number of sulfite pulps. RUDOLF SIEBER. *Zellstoff u. Papier* 2, 27-9(1922); cf. *C. A.* 16, 829.—Chart is shown giving relation between Cl consumption no., % lignin and bleaching properties. Increasing lignin values are associated with higher Cl consumption nos., but there is no close proportionality between the 2 values.

C. J. WEST

Calcium analysis in fresh sulfite liquors by Feld-Sander's method. RUDOLF SIEBER. *Paper* 28, No. 3, 19-22(1921).—See *C. A.* 15, 39.

H. H. HARRISON

Lignin investigations. KARL H. A. MELANDER. *Paper* 28, No. 21, 19-21(1921).—See *C. A.* 16, 490.

H. H. HARRISON

Paper making as a home industry. N. C. BASU. *Bengal Agr. J.* 1, 96-101(1921).—B. believes that time has now come to revive the old industry of paper making as

a home industry. A brief, popular description of necessary operation is given. Mention is made of paper being prepd. from water hyacinth, betelnut husk and jute sticks.

C. J. WEST

Plants suitable as raw materials for paper making. RAYMOND FOURNIER. *Paper Industry* 3, 1532-5 (1922).—See C. A. 15, 1810.

H. H. HARRISON

Nigerian grasses for paper making. ANON. *Bull. Imp. Inst.* 19, 271-82 (1921).—Examn. is reported of the following grasses from West Africa: ekong (*Imperata cylindrica*, Beauv), esun (*Pennisetum*, sp.) eruwa (*Andropogon tectorum*, Schum), jinni (*Andropogon gayanus*, Kunth), gamha (*A. gayanus*, Kunth), sasari (*Chasmopodium afzelii*, Stapf), tsauro (*Cymbopogon giganteus*, Chiov), yama (*Hyparrhenia rufa*, Stapf), kitsi gujma (*H. rufa*, Stapf), haya maria (mixture of various grasses) and wuchiyan hera (*Ctenium elegans*, Kunth). The results showed that the grasses on the whole give very satisfactory yields of pulp and that the pulps have good felting properties and are capable of producing strong papers of good quality. The yields of pulp (30-53.5%) compare in most cases favorably with those obtained from Spanish esparto grass when treated under the same conditions. The pulps are of similar character to one another and closely resemble esparto pulp, although the ultimate fibers are rather shorter. In most cases they bleach easily and would be suitable for the production of good class writing papers.

R. L. SIBLEY

Water used in paper making. ARTHUR S. M. KLEIN. *Paper* 29, No. 11, 12-13 (1921).—A review of water consumption figures as detd. by various authorities. K. gives for unleached sulfite 1 part pulp to 350-400 water, for bleached 1 to 500. It has been found possible to reduce the loss of fiber in waste water to 0.005% of wt. of the water.

H. H. HARRISON

Paper fibers in relation to Mineral loaders. JAMES SCOTT. *Paper* 28, No. 14, 14-15; No. 15, 12-13 (1921).—A description of the common paper-making fibers and the microscopic tests used in identifying them.

H. H. HARRISON

Kraft pulp and kraft paper. ARTHUR S. M. KLEIN. *Paper* 29, No. 13, 9-12 (1921).—A general description. K. advances the opinion that the function of sulfate in cooking liquor is to raise the osmotic pressure of the lyes, and the penetration of the wood chips is accordingly more rapid and thorough, while cooking improves. In practice 15-17% NaOH on the wt. of the dry wood is used for digesting. Pulp which has not been dried yields stronger paper than that which has been dried.

H. H. HARRISON

Dyeing of paper. HEINRICH DIERDORF. *Zellstoff u. Papier* 2, 60-6 (1922).—A good discussion of the general subject of dyeing, written from the standpoint of German dyes. Lists of dyes are given for various types of papers.

C. J. WEST

Dyeing of straw pulp. HEINRICH PRESS. *Paper* 18, No. 16, 23-4 (1921).—See C. A. 15, 2182.

H. H. HARRISON

The analysis of card board. Elasticity. RAYMOND ISNARD. *Paper Trade J.* 73, No. 16, 40-4 (1921).—See C. A. 15, 3205.

H. H. HARRISON

Alum and size superfluous in newsprint. *Newsprint Service Bull.* 50; *Paper* 30, No. 2, 10 (1922).—Mill tests showed alum and rosin size in newsprint to be valueless.

H. H. HARRISON

Chemistry of rosin sizing. RUDOLF SIEBER. *Paper* 29, No. 17, 7-8, 25 (1921).—See C. A. 15, 3395.

H. H. HARRISON

Dyeing cellulose acetate (Brit. pats. 175,486 and 176,034) 25. Fireproofing paper, etc. (U. S. pat. 1,414,609) 20.

Cellulose. G. J. BUSTAMANTE. Brit. 175,330, Oct. 1, 1920. See U. S. 1,402,210 (C. A. 16, 1012).

Reducing cellulosic material to fibers. O. VENTER. U. S. 1,412,763, Apr. 11. Cardboard or other cellulosic material is satd. with NaOH and CS_2 and then mechanically treated to obtain a product adapted for making artificial threads.

Apparatus for recovering solvent vapors from nitrocellulose. K. C. UNDERWOOD, J. E. CRANE and J. M. KESSLER. U. S. 1,412,762, Apr. 11.

Wood pulp. E. F. MILLARD. U. S. 1,413,180, Apr. 18. Mech. pulp prepn.

Paper pulp. F. K. FISH, JR. U. S. 1,413,716, Apr. 25. Wood is treated with H_2O in a sealed container to dissolve H_2O -sol. substances and melt other substances and is then treated with an acid soln. to remove resinous and similar substances and washed with H_2O under pressure.

Sizing paper. A. A. THORNTON. Brit. 175,034, Nov. 5, 1920. In the production of engine-sized paper, whereby a saving of resin and alum is effected, a homogeneous true vegetable or animal colloid soln., such as feculose or other converted or modified starch, or glue, casein, gelatin, albumin, etc., is mixed with resin size, the size is then dild. and mixed with pulp in the beater, and alum or other pptg. agent subsequently added. Any Na silicate used is added before the alum. 15-20% of the modified or converted starch, calcd. to the dry resin, may be used.

Coating for paper. HANJI YONEKURA and NIPPON KAKO SHISHI KABUSHIKI KAISHA. Jap. 38,728, May 26, 1921. The paint coating is made by mixing (1) a mixt. of 100 lbs. clay or $BaSO_4$, 1 lb. K_2CO_3 and 149.4 l. H_2O , (2) 22.5 lbs. casein, 1.7 lb. ammonia and 32.4 l. H_2O , (3) 14.5 lbs. stearic acid, 2.2 lbs. NaOH and 18 l. H_2O , and (4) 8.7 lbs. crystd. $MgSO_4$, 3.6 lbs. $(NH_4)_2SO_4$ and 18 l. H_2O . It makes paper water-proof.

Paper-coating composition. F. COATES. U. S. 1,414,256, Apr. 25. A compn. for oil-proofing paper is formed of H_2O , gelatin, glucose, glycerol and acetone.

Bleaching paper or fabrics. J. C. BAKER. U. S. 1,413,154, Apr. 18. A bleaching soln. is prepd. contg. a base such as $CaOCl_2$ together with Cl in excess of that required for neutralization.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Explosives used in March 1922. W. W. ADAMS. Bur. of Mines, *Repts. of Investigations* No. 2363, 4 pp.(1922).—Beginning with this issue statistics for explosives used in the U. S. are to be issued monthly. The amt. sold during Mar. 1922 was 27,390,364 lbs. representing a gain of 10.9% over that of Mar. 1921 but a loss of 43.8 from the record of Mar. 1920. A table shows the amts. manufactured in Mar. 1922 by states, divided into the categories black blasting powder, high explosives, and permissible explosive, and a gain over Mar. 1921 is shown in each category. Statistics for the particular uses to which the different explosives are put are given.

C. E. M.

Quantitative separation of nitro-body mixtures from nitroglycerin. W. DICKSON and W. C. EASTERBROOK. *Analyst* 47, 112-17(1922).—The residue resulting from the spontaneous evapn. of the Et_2O ext. of the explosive is dissolved in 40 cc. MeOH. Then 25 cc. concd. HCl is added and 25 cc. of a satd. soln. of $FeCl_3$ for each g. of $C_6H_5(NO_2)_3$ present and allowed to stand 24 hrs. The soln. is then extd. with Et_2O , the ethereal ext. is washed with H_2O , dried with $CaCl_2$ and allowed to evap. spontaneously, the

residue being dried *in vacuo*, over H_2SO_4 and weighed. The MeOH is made use of to prevent further nitration of the nitro compds. during the resolution of the $\text{C}_6\text{H}_5(\text{NO}_2)_3$. FeSO_4 may be used in this process but FeCl_3 is preferred.

CHARLES E. MUNROE

The manufacture of safety fuse. H. E. ELLSWORTH AND J. K. BRANDON. *The Hercules Mixer* 4, 128-6, 147-8(1922).—This is a well illustrated description of the manuf. of many varieties of safety fuse stating the characteristics each must possess to meet the requirements of its special use in blasting and the tests to which each is submitted to det. if it possesses them. The treatment of complaints from the field as to the behavior of fuse in use and the description of the methods to be followed in ascertaining to what the alleged fault is really due are quite new in literature and very useful.

CHARLES E. MUNROE

Spontaneous ignition of escaping hydrogen. W. MESSELT. *Engineering* 113, 502(1922).—Many instances of unexplained ignition of H which occurred in connection with the filling of balloons during the war led to expts. with various materials as apertures on the theory that the ignition was due to friction. Eventually it was noted that when the discharge was through an aperture in Fe oxide (rust) it was accompanied by a brush discharge several cm. in length and visible in the dark and which, under certain arrangements of the app., caused ignition. Radioactive substances, such as Th compds., gave no positive results.

CHARLES E. MUNROE

The decomposition of ammonium nitrate by heat. H. I. SAUNDERS. *J. Chem. Soc.* 121, 698-711(1922).—The object sought was to ascertain (1) the nature of the decompn. of pure NH_4NO_3 at moderate temps., (2) how the presence of small quantities of commonly occurring impurities modifies this decompn., and (3) the nature of the explosive decompn. It was found that pure NH_4NO_3 decomposes into N_2O and H_2O to the extent of 98%, the course of the decompn. remaining unaltered over a temp. range from 210-260°. At some point near 300° other N oxides are evolved, the action proceeding explosively. With pure NH_4NO_3 up to 260° N is present in the products to the extent of 2%; immediately after explosion 40%, and if chloride is present 30-50%. At the moment of explosion the NH_4NO_3 yields NO_2 , NO and N_2 in the ratio of 2 : 4 : 5. With pure NH_4NO_3 the rate of evolution of the gas is dependent on the temp. and mass. When chlorides are present the rate of evolution is very much accelerated, 1% producing a result comparable with that caused by a rise in temp. of 25-30° in the pure NH_4NO_3 . Even 0.1% of chloride has a very marked influence on the decompn., Cl being invariably present in the gas evolved. The quantity of Cl in the gas is proportional to the amt. of chloride in the mixt. and the temp. The higher the initial temp. the poorer the gas is in N_2O for any given mixt. At any given temp. the amt. of Cl falls off as time goes on and the compn. of the gas approximates that given by the pure NH_4NO_3 at the same temp. The liquid products of the reaction in these cases contain HCl as well as HNO_3 . Sulfates are without characteristic action. NaNO_3 in small quantities does not influence the decompn. at temps. below 250°. A specially devised thermolyzing and condensing app. attached to a modified Haldane app. was employed. The modification in the latter was a spark gap where one electrode formed an arc at the center of the other since with the ordinary spark gap of the Haldane app. the explosions often shattered the tube. A special method and app. for analyzing the gaseous products were also worked out.

CHARLES E. MUNROE

Plant of the Northern Explosives Co., Ltd., Dragon, P. Q. J. R. DONALD. *Can. Chem. Met.* 6, 101-4(1922).—This plant, designed for the production of standard grades of blasting powders, dynamites and permitted explosives, is the first of its type to be erected under the Explosives Act recently brought into force, and its description

has therefore a special value. This description covers the location, topography and layout, the danger zone being distinguished as the *red area*. The greatest detail is given to the HNO_3 plant, H_2SO_4 concentrator, red area, nitration unit, denitration unit, and dynamite lines. The general arrangement of the *vacuum nitric acid plant* is well illustrated by a detailed drawing to scale.

CHARLES E. MUNROE

Determination of nitrogen in nitric acid esters (KRESSLER, *et al.*) 7. Picric acid. (U. S. pat. 1,413,914) 10.

Technical Records of Explosives Supply, 1915-18. VIII. Solvent Recovery. London: H. M. Stationery Office. 22 pp., 3s. 6d. Cf. C. A. 16, 2030.

Explosive. P. N. STANKOVITCH. U. S. 1,412,319, Apr. 11. A blasting powder is formed of a soln. of dinitrotoluene in nitroglycerin absorbed in a mixt. of NaNO_3 , flour, middlings and S.

Explosive. T. HAWKINS. U. S. 1,413,532, Apr. 18. Hg is treated with a mixt. of HNO_3 and H_2SO_4 and the product is reacted on with alc., the insol. deriv. is sepd. and dried in acid-free condition to obtain a product stronger than ordinary fulminate.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Development of tests for the fastness of dyestuffs. W. J. MURRAY. *Am. Dyestuff Rep.* 10, 231-2, 344-5(1922).—A sketch is given of the methods of testing fastness to light, washing and perspiration, in use during the past 50 years. The various methods are tabulated showing date, authority, conditions of test, time, manipulation and standards. The Am. Assoc. Text. Chemists and Colorists is at present working to establish standard tests for fastness.

L. W. RIGGS

New dyes and sample cards. P. KRAIS. *Z. angew. Chem.* 35, 227-8(1922).

E. J. C.

Note on the tinctorial value of a sample of mssue made about the year 1864. EVA HIBBERT. *J. Soc. Dyers & Colour.* 37, 187(1921).—This sample was manufd. by Perkin at Greenford Green and contained 80% actual color. Loss at 110° was 16.1%. In strength and purity it compares favorably with the best modern productions.

CHAS. E. MULLIN

The surface tension of solutions of Nachtblau. R. DE IZAGUIRRE. *Annales soc. espagn. fis. quim.* 20, 40-55(1922).—Nachtblau dye is a triphenylmethane deriv. with a mol. wt. of 575.5. In aq. soln. it does not diffuse through parchment yet shows no particles under the ultramicroscope. The changes in surface tension produced in a 0.2% aq. soln. by the addn. of minute successive quantities of KI were detd.; a viscostalagmometer was used having a pure-water calibration of 124 drops. The soln. value was 144 drops at the beginning, then as a dil. KI soln. was added, drop by drop, it fell quickly to 120, rose sharply to 128, then decreased very slowly to 124. Almost similar results were obtained with KBr and HBr. No sharp changes in any other phys. properties of the solns. were noted. In alc. soln. Nachtblau exhibits mol. dispersion and KI has no appreciable effect on the soln.

L. E. OLSON

The dyeing of acetyl silk. J. F. BRIGGS. *J. Soc. Dyers & Colour.* 37, 287-86

(1921); *Ans. Dyestuff Rep.* 10, 42-7; *Textile Colorist* 44, 243-4, 306-8; *Canadian Dyer & Color User* 2, 5-8, 36-7 (1922).—Acetyl silk usually contains 3-7% moisture and the absorption of H_2O during immersion is far less than with other artificial fibers. This resistance to H_2O accounts for its remarkable properties when wet. In its original condition it has little affinity for substantive dyes and therefore cotton will not usually bleed onto it. When the fiber is treated with caustic or other alkali a saponifying action removes some Ac groups, leaving the cellulose with affinity for substantive dyes. This sapon. may take place in the dyebath or previously, and is best accomplished by NaOH soln. at 75° . The action is controlled by the quantity of NaOH present in the bath, and the proportion of modified fiber detd. by extn. with dry hoiling acetone. The insol. residue is pure cellulose and partially modified cellulose acetate. The cellulose in the residue or a new sample may be detd. by extg. 3 times for 2 min. each with 10 times its wt. of active cuprammonium solvent. The ext. is acidified, the ppt. washed, dried, and weighed as cellulose. This method of dyeing is giving way to the direct method, in which advantage is taken of the properties of the silk as a cellulose ester, and the dyeing is carried out with selected dyestuffs without any modification of its chem. properties. Dyes contg. amino, alkyl-amino, hydroxyl, nitro and ketonic groups are particularly adapted for the direct method. All basic dyes may be used without previous treatment of the fiber but $MgCl_2$ and $AcOH$ are usually added to the bath. In many cases the fastness to light is remarkable. The gallocyanin and alizarin dyes are applied directly without mordants. A cold bath is used in the beginning. Certain sulfonated azo colors are dyed directly, and some are fixed by after-chroming. Some vat dyes are suitable for dyeing the unsaponified fiber, and NH_4 salts in the bath inhibit sapon. S dyes are suggested, when reduced in the same manner as vat dyes. On account of the affinity of the fiber for aromatic amines and phenols, it is particularly adapted to dyeing with developed azo dyes and aniline black. It may also be "dry dyed", from benzene.

CHAS. E. MULLIN

The indigo situation in India. H. E. ARMSTRONG. *J. Roy. Soc. Arts* 70, 400-29 (1922).—In this address a review is given of the excellent work of W. A. Davis upon the growing of indigo in India and the prepn. from the plant of an ext. superior, except for light shades, to the 20% indigotin paste from Germany. The indigo plant being a legume is particularly necessary to the agricultural industry of India where fertilizers are scarce.

L. W. RIGGS

Chemical research and textile industry. F. A. HAYES. *Textile World* 61, 2323-5 (1922).—A general article urging close cooperation between the lab. and mill. C. E. M.

The research institute for bast fibers in Sorau. WILLI MÜLLER. *Umschau* 26, 289-92 (1922); illus.

E. J. C.

A new diastase preparation and its significance for the textile industry. GIOVANNI TAGLIANI. *Z. angew. Chem.* 34, Aufsatzteil, 69-73 (1921).—An examn. of the strengths of 4 com. diastase preps., Ferment D (liquids) and A (powder), and Fermasol DS and DB (solid). Results are given of their dissolving power on starch with and without NaCl. Their action in removing starchy matter from raw wool fabrics is satisfactory, Fermasol DB being preferred. There is very little loss in wt. and no damage to the wool. Three figs. are given of raw textile fabrics before and after treatment.

F. L. SEYMOUR-JONES

The differentiation of hemp (*Cannabis sativa*) from pseudo-hemp (*Crotalaria juncea*) in fabrics, cordages, etc. M. PONTIO. *Chimie et industrie* 7, 664-8 (1922).—A detailed description of the microscopic characteristics of hemp and of pseudo-hemp (known commercially as Bomhay, Madras, Jubulpoore, Sunn, etc., hemp). The chief points to notice are the length of the fibers, the histological characteristics of the epi-

dermis and parenchyma, the coloration of the fibers with $\text{I-H}_2\text{SO}_4$ and the color and Fe_2O_3 content of the ash. The following procedure is recommended for the prepn. of the fibers for microscopical examn. For tows, take an av. 3 g. sample; for cordage, sample the core and outside strands separately; for fabrics, sample the warp and filler separately. Boil for 15 min. in 150 cc. of 2% NaOH, decant, boil for 15 min. with a fresh 150 cc. portion of 2% NaOH, wash with running tap water until neutral, boil 2 min. with a mixt. of 25 cc. of 1° Bé. NaOCl and 75 cc. water, wash thoroughly, treat 5 min. with a mixt. of 75 cc. of 5° Bé. NaHSO_3 and 75 cc. of water, wash to neutral reaction, and keep in distd. water. Place a few fibers on a microscope slide, dry with filter paper, add a few drops of 1 soln. (3 g. of KI and excess of resublimed I in 100 cc. of water), remove the excess with filter paper, dry, add 2-3 drops of acid (66° Bé. H_2SO_4 , 24 g., H_2O 16 g., 22° Bé. glycerol 16 g.—should not be more than 1 month old), mix thoroughly with a dissecting needle, place the cover-glass in position, remove the excess of acid with filter paper, and exam. under a magnification of 125 diams.

A. P.-C.

Cleanliness in the scouring of textiles. JOHN SCHOFIELD. *J. Soc. Dyers & Colour.* 37, 103-7; *Textile Am.* 36, No. 1, 60-4, 66; *Textile Colorist* 43, 841-3(1921).—The surface area of a single wool fiber 1 in. long with a mean diam. of 0.001 in., considered as a cylinder, is 0.00314 sq. in. and its vol. is 0.000,000,785 cu. in. Assuming the sp. gr. of air-dried wool to be 1.33, its wt. is 0.000,000,038 lb. and there are over 25,000,000 such fibers to the lb., with a total surface area of approx. 580 sq. ft. If 10% of oil is used in spinning, each fiber has a film of oil on it 0.000,001 in. thick. Under certain conditions the wool itself might occupy only 0.02% of the space occupied by the stock the other 98% being air. These factors must be considered in the selection of wool oils, as well as the method of scouring. A specification of the free fatty acid content of wool oils, as well as the saponifiable matter, is suggested, as this factor greatly influences the removal of the oil with carbonate and also the amt. of soap to be added to the scouring soln. Two standard methods of scouring piece goods are suggested. Materials of construction of textile equipment are discussed. Al is recommended for a wider use. Birch, beech, poplar and sycamore are the most suitable woods for use where it is in contact with the fabric.

CHAS. F. MULLIN

Standard scouring systems. J. SCHOFIELD. *J. Soc. Dyers & Colour.* 37, 298-301 (1922); cf. preceding abstr. and C. A. 15, 760.—Water contg. over 6° or 7° of hardness should be softened for scouring purposes. In scouring with a hard water plenty of alkali but little soap should be used. Surface waters should be filtered. Equally as good results may be obtained with dil. soda soln. as with NH_4OH , the tendency of most scourers being to use too much soda. It is better to use a 2 stage scour with a dil. soln. than a single scour with a strong soln. Soaps made from oils of low m. p., such as distn. oleins, are recommended and may be used at a lower temp. The addition of a pint or less of suitable "solvent" to the machine gives very good results in certain cases. Et_2O , CCl_4 , C_6H_6 , petroleum spirit, turpentine and tetrachloroethane, together with suitable emulsifying agents have been used in the prepn. of these solvent solns. The action of the solvent is not only that of soln. but a lowering of surface tension. Cresols have been used effectively in connection with soap, but the scoured goods may develop a cresol odor later.

CHAS. F. MULLIN

Scouring and milling. J. SCHOFIELD. *Am. Dyestuff Rep.* 10, 349-52(1922).—Details are given for the sapon. scour, fancy worsteds scour and the "low goods" scour. On this subject it may be said, first know what substances are to be removed from the fiber and then apply the facts of chemistry and physics for their removal.

L. W. R.

Chemical aspects of waterproofing and mildew-proofing textile fabrics. WM. H. ADAMS. *Am. Dyestuff Rep.* 10, 334-5(1922).—Waterproofing is confined largely to cotton fabrics. For complete protection of the fabric waterproofing must accompany mildew-proofing since the living organisms which are the most active agents in the destruction of cellulose fiber all require moisture. The destructive agents are algae which require a continuous supply of water, mucors which require moisture and darkness, and fungi the most destructive class, the spores of which are universally distributed. Algae are poisoned by Cu in soln.; mucors require treatment with org. resins; fungi must be treated with disinfectants such as phenol, cresol and pyridine all of which must be mixed with suitable retaining ingredients which fix them on the fiber and prevent volatilization. The various substances thus used are discussed in a general way. A recent method is to sat. the fabric with an ammoniacal Cu soln. and drive off the excess of NH_3 when the fiber remains coated with a Cu cellulose compd. which is water-repellent and mildew-proof. L. W. ROGGS

Bleaching with hypochlorite. RASSER. *Chem. Tech. Ind.* 19, 457-9(May 10, 1921); *Chimie et industrie* 7, 764(1922).—Tendering of linen is due not to the oxidizing action but to a finely divided deposit of CaCO_3 which coats the fibers, prevents bleaching, and causes the subsequent yellowing. CaOCl_2 is dangerous for linen. NaOCl , and especially electrolytic NaOCl , is the most important hypochlorite. Even in the case of highly infected linen, the max. concn. allowable is 20% of available Cl, and the max. time of treatment 4 hrs. Linen can be bleached and deodorized without injury with 15-20% less soap and 20% less labor. The value of this liquor rests in its germicidal and stain-removing qualities, coupled with non-injury to the fabric. R. backs his statements by describing in detail tests by various experimenters on the germicidal power of NaOCl , stating in each case the organisms used. They showed that sterilization was complete, even with resistant pathogenic germs, at the end of 4 hrs. with 2% available Cl, provided the liquor was evenly distributed throughout the linen. Blood, feces, menstruation, and cacao stains were completely removed. Linen was not injured by the treatment; wool was affected after 12 hrs. by 2% of available Cl; and silk did not seem to stand up against this treatment. The decrease in the amt. of rubbing required increased the life of the linen. From the point of view of cost, electrolytic NaOCl liquor can compete with bleaching powder. A. P.-C.

Distinction between wool and tussah silk. ANON. *Textile Am.* 37, No. 1, 27 (1922).—A foreign plush with a cotton back and a very lustrous pile, which was at first thought to be mohair, upon microscopic examn. proved to be tussah silk. C. E. M.

Modern calico printing. ANON. *Textile Am.* 36, No. 6, 40, 58(1921); 37, No. 1, 18-9, 60-5(1922).—A general article with a few formulas. CHAS. E. MULLIN

The chemist in the hosiery trade. A. HANCOCK. *J. Soc. Dyers & Colour.* 37, 113-7(1921); *Textile Am.* 37, No. 2, 61-5, 80(1922).—A review of the progress with suggestions for further research. Particular attention is paid to the unshrinkable process for wool. CHAS. E. MULLIN

Application of ion-concentration measurements to the control of industrial processes (KEELER) 1. Wool-scouring wastes for fertilizer purposes (VEITCH) 15. Dyeing of paper (DIERDORF) 23. Diaminoanthraquinones (BATTEGAY, CLAUDIN) 10. Measurement of color (LOWRY, MCHAYTON) (TRILLICH) (BAWYREE) 2. Color circles (THOMAS) 2. HClO and Cl, with comparison of their bleaching action (TAYLOR) 18. Dyeing leather (Brit. pat. 175, 250) 29. Bleaching (U. S. pat. 1,413,154) 23. Glue-

precipitating condensation products (U. S. pat. 1,412,949) 29. Fireproofing textile fabrics, etc. (U. S. pat. 1,414,609) 20.

SHREVE, R. NORRIS: *Dyes, Classified by Intermediates*. New York: Chemical Catalog Co., Inc. 632 pp. \$10.

Indigo dyes. M. BOUVIER. U. S. 1,412,038, Apr. 11. *p,p'*-Dimethylindigo is halogenated to produce 5,5'-dimethyldihromindigo which gives sharp blue dyeings less reddish than those of dihydroindigo.

Halogenated indigo derivatives. M. BOUVIER. U. S. 1,414,335, May 2. A soln. of sulfuric chlorohydrin is stirred with P_2O_5 and Br and dihydro-*o*-tolylindigo or a similar compd. is added to the cooled mixt. to prepare green or blue dyes.

Dye from nitrated resin. R. ARNOT. U. S. 1,414,164, Apr. 25. See Brit. 173,254 (C. A. 16, 1509).

Brown dye. W. B. RICHARDSON. U. S. 1,412,707, Apr. 11. By reacting upon dihydroxynaphthalene with HNO_3 a reddish brown dye is obtained dyeing unmordanted silk a brilliant light brown, dyeing unmordanted wool a slightly darker brown and dyeing tannin-mordanted cotton grayish brown.

Manufacture of formaldehyde sulfoxylate. SHIN-ICHIRO MITSUOKA. Jap. 38,776, June 1, 1921. $NaHSO_4 \cdot CH_2O + 2 H_2O$ is manufd. by treating hydroxymethanesulfonic acid with Zn dust and NaOH in the presence of formose. Dried SO_2 is introduced into a mixt. of 10 pts. of 10% formose and 85 parts of 35% CH_2O at 15° until the wt. is increased by 64 pts. To the mixt., 21 ppts. Zn dust, 80 pts. NaOH (d. 1.17) and a small quantity of 10% formose soln. are added and the whole is agitated, a temp. of 10° being maintained, during which an additional 160 pts. of the NaOH soln. and 44 pts. of Zn dust are gradually and alternately added. After 4-5 hrs. the product is sepd. from $Zn(OH)_2$ concd. by evapn. and crystd. It is used for dyeing.

Dye soap. C. C. HUFFMAN. U. S. 1,413,026, Apr. 18.

Dyeing textiles or leather. A. LINZ. U. S. 1,414,029, Apr. 25. Textiles or leather are dyed, after preliminary treatment with a soln. prepd. from phosphates and tungstates or molybdates and acid, to form lakes. Tannin and Sh salts may be used on hides preliminarily. U. S. 1,414,030 specifies first dyeing with a basic dye such as methyl violet or auramine and then treating with a soln. prepd. from Na tungstate, Na_2HPO_4 or similarly acting W, Mo and Si compds. in acid soln. U. S. 1,414,031 relates to the similar use of solns. formed from acids of W, Mo, Si and P.

Dyeing cellulose acetate. BRITISH CELLULOSE & CHEMICAL MANUFACTURING CO., LTD. and L. G. RICHARDSON. Brit. 175,486, Dec. 18, 1920. The partial or superficial sapon. of cellulose acetate threads or fabrics by alk. agents prior to or during dyeing is regulated or controlled by the addn. of NaCl or Na_2SO_4 or other alkali salts of strong mineral acids in concns. up to 5%. These salts may be partly replaced by NaOAc described in 176,034 (see below) or by the salts specified in 175,486 (see below). According to the Provisional Specification, the invention is not confined to the above-mentioned salts or concns. In Brit. pat. 175,486, Dec. 18, 1920, sapon.-controlling agents specified are alkali silicates, aluminates, or borates, used either alone or with added alkali. Water-glass is preferred; when used alone it should be employed in such quantity that after the sapon. the residual alkali retains the silicic acid in soln. NaOAc may be added as described in 176,034. In Brit. pat. 176,034, Sept. 28, 1920, the sapon.-controlling agent specified is NaOAc in concns. up to 5%. The Provisional Specifi-

cation does not limit the invention to the above-mentioned concns. Cf. 169,741 (C. A. 16, 836).

Artificial fibers. W. P. DREAPER. Brit. 175,746, Nov. 19, 1920. So-called "staple fiber," which is obtained by cutting up filaments prep'd. from cellulose solns., etc., is rendered non-inflammable by treating the formed filaments at a stage prior to the cutting-up with fireproofing solns. such as are ordinarily employed in fireproofing textile materials. The treatment may be carried out after the usual drying process, or in the case of viscose filaments optionally while the filaments are in the gel condition, or in the case of nitrocellulose filaments, immediately after the denitration. According to examples, Na tungstate is deposited on the filaments by treatment with a soln. of this salt in HOAc, and Al tungstate by treatment with a soln. of Al acetate and Na tungstate in HOAc. To waterproof the threads, an excess of Al acetate may be employed in the 2nd case, or HCHO may be added to the bath; or the threads may be treated subsequently with HCHO.

Artificial silk. E. BRONNERT. Brit. 174,960, Aug. 3, 1920. Relates to the draw-spinning process for the manuf. of very fine threads of viscose silk, in which the viscose soln. is spun into a column of liquid suspended by atm. pressure, and the thread is drawn out by the wt. of the suspended portion, as described in 16,588, 1903. A viscose contg. a high % of only slightly degraded cellulose is employed, and the coagulating liquid consists of a soln. contg. 0.5–1% of benzenemono- or di-sulfonic acid or lactic acid, 5% of NH_4SO_4 , and 5–10% of glucose. Cf. 8083, 1902, 8711, 1908, 15,448, 1908 and 15,449, 1908.

Artificial silk. E. BRONNERT. Brit. 174,961, Aug. 6, 1920. The process of manuf. of artificial silk described in 163,817 (C. A. 16, 166) 166,931 (C. A. 16, 501) and 170,024 (C. A. 16, 1016) is modified in the case of viscoses of viscosities higher and lower than the normal, by employing spinning apertures of a diam. greater or less than the normal 0.1 mm., and adjusting the minimum acid concn. of the p'tg. bath according to the cross-section of the spinning aperture and to the titer of the finished thread. Tables are given which indicate the proper acid concns. for spinning threads of 8–2 deniers with viscose of different viscosities; spinning-apertures of 0.17–0.05 mm. diam. are employed. Part of the H_2SO_4 of the p'tg. bath may be replaced by an equiv. quantity of $(\text{NH}_4)_2\text{SO}_4$ as described in 170,024 (C. A. 16, 1016); and to the bath may be added oxy-acids, glucose, etc.; or these addns. may be made to the viscose itself.

Threads from viscose. E. BRONNERT. U. S. 1,414,070, Apr. 25. Crude viscose is forced in filaments into a coagulating bath of dil. inorganic acid at a temp. of 25–50°, the age of the viscose being so proportioned to the concn. and temp. of the bath as to form a thread which can be wound.

Spinning viscous liquids to form threads. E. ELSÄESSER. U. S. 1,414,076, Apr. 25. In forming threads or filaments from cuprammonium cellulose or similar compns., a coagulating bath is employed which has previously been freed from gases and bubbles to facilitate obtainment of a uniform thread.

Treating wool for use in mixed fabrics. W. H. SCHWEITZER. U. S. 1,413,621, Apr. 25. Wool is successively treated with oxidizing and alk. substances such as CaOCl_2 and NaOH and the fiber thus prep'd. is used with somewhat less than twice its wt. of artificial cellulose fiber to produce a lustrous fabric of uniform appearance and resistant to H_2O .

Waterproofing. J. R. ROTHEN. U. S. 1,414,670, May 2. A compn. for waterproofing textile fabrics is formed of a neutral soap made from animal and vegetable fats, paraffin, coumarone resin and linseed oil.

Steam treatment for expanding spun silk yarn. S. SAKANE. U. S. 1,413,193, Apr. 18.

Apparatus and method for recovering solvents from coated fabrics during drying. I. W. ROBERTSON. U. S. 1,413,788, Apr. 25.

26—PAINTS, VARNISHES AND RESINS

A. R. SABIN

Dr. Wilhelm Fahrion. HANS WOLFF. *Farben-Ztg.* 27, 1723(1922).—An obituary.

F. A. WERTZ

Colloidal observations in paint and varnish chemistry. III. The structure of pigments and their behavior in oils and varnishes. W. SCHLICK. *Farben-Ztg.* 27, 1792-4; 1872-3(1922); cf. C. A. 16, 2032.—Many earth pigments, such as ochers and siennas, are gels (cf. Cornu, C. A. 3, 2111). The degree of dispersion of chem. pigments depends on the concn. of the reacting solns. Max. particle size is obtained with solns. of medium concns. The degree of dispersion of pigments is usually increased on grinding with oils or varnishes. Tinting strength, opacity, oil absorption, etc., are also dependent on the degree of dispersion of the pigment. All livering of paints are colloidal phenomena, and the settling of pigments in vehicles is probably often due to adsorption of various colloids especially of coarsely dispersed driers or resins. The colloidal particles in suspensions of ochers, chrome yellows, umbers, etc., in oil vehicles are usually positively charged; while those of fused metallic resinates are negatively charged. The heavy settling of pigments may sometimes be caused by these oppositely charged colloids neutralizing one another.

F. A. WERTZ

Colorimeters for testing of oils and paints. F. W. SHULENBERGER. *Paint, Oil, and Chem. Rev.* 73, No. 18, 8-9; No. 19, 8-9(1922).—A brief review of the construction and methods of operation of the various colorimeters for liquids, such as the Schreiner, Saybolt, Lovibond, Duboscq, Nutting, etc.

F. A. WERTZ

A new ship's bottom paint. HUGO BURSTIN. *Chem.-Ztg.* 46, 312-3(1922).—The acid salts of naphthenic acids with Hg, Cu, As, Pb, Ni, etc., dissolved in benzene, C_6H_6 , tar, etc., and with 10 to 20% of resins added to harden the film, produce good anti-fouling paints. The basic and neutral salts are not sufficiently sol. in these solvents to be effective. The consistency of the acid salts is such that no non-volatile vehicle is necessary for their application, and they are sol. enough to exert powerful toxicity; the slight hydrolysis which takes place in sea water produces both a toxic base and acid.

F. A. WERTZ

The manufacture and properties of titanium white. CH. COFFIGNIER. *Chimie et industrie* 7, 651-61(1922); cf. Carteret, C. A. 15, 928; Coffignier, C. A. 16, 840.—A description of the various methods of prepn. of Ti white and of its merits as a pigment.

A. P.-C.

Super centrifugal force and its application to the clarification of varnish and the dehydration of oil. A. H. KEABLE. *J. Oil Colour Chemists' Assoc.* 5, 2-15(1922).

F. A. WERTZ

Measurement of color (LOWRY, McHATTON) (TRILLICH) (BAWTREE) 2. Cement and its painting (ANON) 20. Color circles (THOMAS) 2. The hydrogenation of naphthalene (FURNESS) 10. Theory of polymerization in fatty oils (SALWAY) 27. Heat treatment of oils (Brit. pat. 175,406) 27.

Reports on Lac, Turpentine and Rosin. London: John Murray. 74 pp. 2s.

Paints. E. V. SCHOU. Brit. 175,764, Nov. 24, 1920. Emulsions for painting and priming purposes, having an aq. disperse phase and an oleaginous continuous phase, are made by gradually adding H_2O with const. stirring to a viscous oil having strong water-dispersing properties. Suitable oils are oxidized or polymerized linseed and other drying and semi-drying oils, and blends of other oils, particularly those contg. linolenic acid and oil of turpentine or the like, with resins, copals, lac gums, rubber, etc. Substances such as glue, gum, and casein may be dissolved in the H_2O . The emulsions, which may contain 75% of H_2O , are sol. in oil, and may be dild. with turpentine, petrol, paraffin oil, or the like. The dild. emulsions may be treated by homogenizing machinery. Priming and impregnating ingredients may be mixed with the H_2O before emulsifying or dissolved in the emulsion, with which oil-ground pigments may also be incorporated. Cf. C. A. 15, 1224.

Paint. H. SELLMAN. U. S. 1,412,898, Apr. 18. Pigment and volatile and oxidizable vehicles are mixed in a rotating drum contg. free reducing bodies such as flint pebbles or metal balls in order to grind uniformly without loss. The grinding may be *in vacuo*.

Paint. J. F. STEENMEYER. U. S. 1,414,597, May 2. A mixt. of pigment such as ZnO 100, linseed oil 47, petroleum 45 and drier 5 parts, adapted for use on walls as a "flat" paint.

Lithopone. J. A. SINGMASTER and F. G. BRBYER. U. S. 1,414,793, May 2. In calcining lithopone, an inert gas such as superheated steam is passed through a mass of the material at a high temp.

Pigment. L. BAKER. U. S. 1,413,565, Apr. 25. A mixt. contg. ZnS , ZnO and $BaSO_4$ is pptd. from a basic soln. of $ZnSO_4$ by heating with steam and air and adding BaO_2 and ZnO and, later, Ba sulfide.

Paint-drying composition. H. A. GARDNER. U. S. 1,412,399, Apr. 11. The compn. contains tung oil and the products resulting from the partial or complete neutralization of an acid resin by a dechlorinated hydrocarbon.

Varnish. H. W. and R. W. SUMMERS. U. S. 1,413,628, Apr. 25. Vegetable gum is mixed with thinners, tung oil, camphor gum, naphtha and oil of lavender.

Varnish. I. F. LAUCKS. U. S. 1,413,666, Apr. 25. A varnish is formed from a liquid vehicle such as linseed oil together with resinous matter obtained from coal by extn. with the oil while hot and adding turpentine and C_6H_6 .

Varnish. S. CABOT. U. S. 1,413,964, Apr. 25. Tung oil which is highly polymerized without oxidation or decompn. is used with a coal tar distillate and a drier.

Resin-shellac composition for varnishes. L. WEISBERG. U. S. 1,413,144-5, Apr. 18. Shellac is used with a glycerol polybasic acid resin such as that formed from phthalic or diphenic acid together with solvents such as acetone, alc. or $EtOAc$ to form varnishes adapted for *elec. insulation*.

Recovering varnish, etc. H. C. S. DE WHALLEY and MICANITE AND INSULATORS CO., LTD. Brit. 176,117, Nov. 29, 1920. Addn. to 155,318 (C. A. 15, 1197). In the process for the recovery of varnish and other ingredients from scrap micanite described in the principal patent, a bath of liquid having a higher b. p. than that of H_2O , such as a high flash point naphtha, and at atm. pressure is substituted for a bath of H_2O or alk. soln. under pressure. The softened material is then stirred into a bath of alc. or other solvent of the varnish.

Resin from naphtha. F. H. RHODES and A. E. ROBERTS. U. S. 1,413,558, Apr. 18. In prep. resin from naphtha, the naphtha is washed, after polymerization and

neutralization, with a soln. of NH_4Cl , NaCl or CaCl_2 in order to facilitate separ. from aq. liquor. Cf. C. A. 15, 951.

Purifying sticklac. W. A. FRARMOUTH, J. C. NAGLE and KESTNER EVAPORATOR & ENGINEERING CO., I.T.O. Brit. 175,023, Nov. 4, 1920. Sticklac is crushed, preferably to such a size that it passes through a sieve of 20 meshes to the in. but not through one of 30 meshes, and the product is washed by agitation with H_2O , preferably rendered slightly alk. The washed material, either before or after drying and dry cleaning by means of a current of air, is mixed with a liquid, such as a soln. of sugar or of a salt, of greater d. than H_2O , and a clean granular lac resin free from heavier and lighter impurities is obtained from the suspension by classification in a settler or an imperforate centrifuge. The settled impurities and also the dust from the crushing operation may be treated with solvents to recover further quantities of resin. A suitable liquid for the classification has a d. of 1.05, but the d. may be varied according to the nature of the raw material treated.

Phenolic condensation product. K. KULAS and C. PAULING. U. S. 1,414,139, Apr. 25. PhOH and CH_3O are heated with an acid condensing agent such as HCl until a resin is formed and the mass is allowed to stand until stratified. PhOH and CH_3O are then added to the hot material with an alk. condensing agent such as NaOH in such quantity that after neutralizing the acid there is an excess of alk. agent of more than 10% of the PhOH used and the mixt. is then heated to complete final resin formation.

Printing ink. SHINJIRO HORII. Jap. 39,044, June 28, 1921. It is made of 100 pts. Al soap, 20-40 Ca soap, 10-20 Mg soap, 120-200 machine oil, 40-70 H_2O and 40-60 C black.

Printing ink. SHINJIRO HORII. Jap. 39,066, July 1, 1921. The ink is made of 100 pts. Al soap, 30-45 Ca soap, 10-20 Mg soap, 45-80 distn. products of bird lime (or whale wax, Chinese wax, etc.), 75-100 mineral oil, 45-75 H_2O or dil. soap soln., and 45 C black.

27—FATS, FATTY OILS AND SOAPS

E. SCHERUBEL

Properties of "Tohaku oil" and its composition. YOSHITORA IWAMOTO. *J. Chem. Ind Japan* 24, 1143-60 (1921).—"Tohaku oil" is obtained from the seeds of "Tohaku," *Lindera obtusiloba*, B. L., and is valued highly as hair oil by Koreans. Its characteristics are $d_{40} 0.9329$, $n_D^{20} 1.4653$, solidifies at -14.4° , acid no. 4.30, sapon. no. 263.80, Wijs 70.82, R.-M. no. 2.61, Polenske no. 9.85, acetyl value 16.42, Hehner value 90.08, and unsaponifiable matter 1.60%. Of all hair oils now in use, none has such a high sapon. no. as this oil. The main solid fatty acids are capric and lauric acid, and probably a few other lower fatty acids, but palmitic and stearic acids are absent. Among the liquid acids, I. identified oleic acid and one other unsatd. acid, $\text{C}_{15}\text{H}_{31}\text{O}_2$ (similar to one found in cochineal fat). Hazra and bromination tests show the absence of linolic and linolenic. S. T.

The theory of polymerization in fatty oils. A. H. SALWAY. *J. Oil Colour Chemists' Assoc.* 5, 16-24 (1922).—See C. A. 15, 770. F. A. WERYZ

Non-flammable mixtures of solvents. B. F. DODGE. *Chem. Met. Eng.* 26, 868-9 (1922).—A criticism of the article by Sievers and McIntyre (Cf. C. A. 16, 1874).

H. L. OLIN

Investigation of household soaps. A. E. SANDELIN. *Hyllningsskrift tillägna*

Ossian Aschen 1920, 103-9.—Gives the methods employed by S. in analyzing soaps and also analyses of soaps from various sources. C. E. CARLSON

Determination of fatty acids (ARNOLD) 7. Mechanism of catalytic hydrogenation (SKITA) 10.

BRAUN, KARL: Die Seifenfabrikation. 2nd Ed. revized. Berlin and Leipzig: Sammlung Goschen. M 9. Reviewed in *Z. öffent. Chem.* 28, 84(1922).

Hydrogenating fats and oils. W. J. MELLERSH-JACKSON. Brit. 175,021, Nov. 3, 1920. Into a body of liquid fat or oil to be hydrogenated, H is introduced in a condition of minute dissemination by passage through a porous plate at the bottom of the vessel whereby the H is distributed uniformly and intimately throughout the body of oil, and the catalyst is, without the aid of mechanical stirring devices such as beaters or paddles, maintained in uniform suspension in the oil simply by the levitating action of the H. The treating vessel is provided with a heating or cooling jacket or alternatively a heating or cooling coil may be immersed in the oil; and the porous plate, preferably made of a ceramic material known as "Filtros," is held in position by set-screws, and is sealed by cement.

Heat treatment of oils. R. I. CLARK & CO., LTD. AND J. N. TERVET. Brit. 175,406, Nov. 15, 1920. App. for the heat treatment of oils, particularly oils used in the manuf. of varnish, comprizes a no. of pipes or receptacles arranged in series within a furnace so that the last of the series is most strongly heated, and followed by a cooling pipe. The receptacles may be provided with vents to permit the removal of vapor, and the last unit of the series is fitted with a thermometer enclosed in a tube. A suitable construction is specified.

Aerating soap. T. M. GODFREY. U. S. 1,414,015, Apr. 25.

Cleansing liquids. S. HEINE. Brit. 175,822, Dec. 13, 1920. Decoctions of bilberry leaves are used warm to clean tissues and fabrics. The prior use of decoctions of ivy, chestnuts, tomatoes, and potatoes as scouring liquids, and of soap substitutes contg. plant or fruit exts. and soda or ammonia is referred to.

28—SUGAR, STARCH AND GUMS

F. W. ZERRBAN

New viewpoints in the sugar industry. A. L. VAN SCHERPENBERG. *Chem. Weekblad* 19, 169-73(1922).—An address, pointing out how in the sugar, like in other industries practical observations and advances by empirical methods are often made, which cannot be satisfactorily explained until fundamental science has made the necessary progress. As examples are cited (1) the purifying effect of lime and of CaCO_3 ; (2) the retarding influence of Ca salts in the juice on the filtration of the mud; (3) the differences in apparent solids found upon concg. or dilg. sugar products; (4) the control of diffusion. Modern theories are applied to these problems, and the necessity of close coöperation between industry and scientific institutions is stressed.

F. W. ZERRBAN

Chemical control results of Hawaiian factories from 1912 to 1921. ANON. *Intern. Sugar J.* 24, 194-5(1922).—These figures show a const. decline in cane polarization since 1912, when it was 14.34, to 13.12 in 1921. The tons of cane required to

produce a ton of com. sugar increased from 7.99 to 8.61. Milling losses decreased from 6.92 to 2.64, and maceration water used increased from 30.79 to 40.80% in 1919. The press cake polarization varied from 0.24 to 0.33 per 100 polarization of cane, the amt. of final molasses from 2.80 to 3.63 on wt. per 100 of cane, and the sucrose in molasses from 0.99 to 1.22 per 100 of cane.

W. L. OWEN

Thornycroft continuous sugar beet diffuser. JOHN I. THORNYCROFT. *Engineering* 113, 315-7(1922).—The purpose of this app. is to do away with the complicated system of valves and pipes necessary in a diffusion battery, and to save labor. Its essential parts are a single vertical cylinder, 5.5 m. high and 0.7 m. in diameter, a rectangular tank near the bottom of the cylinder, and a small heater connected with the latter. The tank is divided by a perforated plate into 2 compartments, into one of which the fresh cossettes drop, while the diffusion juice ready to be drawn off fills both of them. The chips enter into the bottom of the cylinder through a slide valve, being lifted into it by a piston and a mushroom valve, all of them operated hydraulically. Inside of the cylinder the chips are slowly elevated by screw blades, and drop out at the top completely exhausted. The diffusion water enters at the top, its flow being regulated automatically. All of the moving parts are properly synchronized and are driven by a single motor. Circulation of the juice within the cylinder is kept up at three levels by small centrifugal pumps, and several steam jets serve to keep the juice hot. Detailed drawings and several pictures are shown.

F. W. ZERBAN

The utilization of final molasses. R. CARPENTER. *Facts About Sugar* 14, 390-1, 392(1922).—A general discussion of the increased importance of final molasses as a by-product in the raw sugar industry. The principal uses discussed are (a) as a liquid fuel, (b) as a component of cattle food and (c) as a raw material for the production of EtOH. Attention is focused largely on its value as a source for fuel alc. Formulas are given, a comparison is made with gasoline and the outlook for future demand is discussed. A description is given of app. required, with special reference to distg. app., denaturing and mixing, and cost of production. Finally there are comments on the return of soil constituents which the utilization of molasses involves.

N. K.

Economy in the use of water. HERBERT WALKER. *Intern. Sugar J.* 24, 183-7 (1922).—The 3 most important factors in detg. how much maceration it is profitable to apply in the milling of cane are: (1) the gain in sucrose extn. resulting from each increase of 1% of maceration water; (2) the net value of 1% increased extn. based on a definite wt. of cane and on current sugar prices; (3) the cost of extra fuel required to evap. the water due to 1% maceration. Tables are given showing the increase in extn. on a 12-roller mill by increasing the maceration by stages of 10 from 20 to 60%, also the value of a 1% increase in extn. with the polarization of cane varying from 10 to 17, and the price of 96 test sugar varying from 4 to 8 cents a lb. Figures are given that show the increased extn. that must be obtained from each additional 10% increase in maceration to yield a profit under varying conditions of cane polarization, and cost of fuel oil.

W. L. OWEN

Separation of bagacillo, etc., from cane juice after liming, using the Carter automatic strainer. ANON. *Intern. Sugar J.* 24, 203(1922).—Results of some expts. with the Carter Automatic Strainer on cold limed juice by the West India Sugar Finance Corpn. at their Central Consuelo, Dominican Republic. The ordinary mill juice strainer had a 12-mesh brass punched plate with 144 holes per sq. in., size of opening 0.053 in., while the Carter Strainer had 3 sets of twilled monel metal wire cloth varying in mesh from 20 to 40, and size of openings varying from 0.022 to 0.015 inches. Up-

wards of 17,000 lbs. of bagacillo were removed from the cold juice each 24 hrs. from 240 tons of cane.

W. L. OWEN

Application of ion-concentration measurements to the control of industrial processes (KESLER) 1. Molasses for feeding purposes (WHALLEY) 12.

Annuario delle Fabbriche di Zucchero, Raffinerie, Distillerie, ecc. per l'anno 1921-22. Edited by Associazione Italiana delle Industrie dello Zucchero e dell'Alcool. Bologna: Stabilimenti Poligrafici Riuniti. Reviewed in *Z. Ver. deut. Zucker-Ind.* 1922, 140.

29—LEATHER AND GLUE

ALLEN ROGERS

Report on the activities of the German Leather Trades' Experimental Station during 1920. J. PARSSLER. *Collegium* 622, 48-50 (1922).—The work included numerous analyses of vegetable tanning materials and exts., fats, leather, bleaching material and whitening. Extreme values and averages are given. One "bleaching material" consisted of sugar, Epsom salts, and water, in reality a weighting adulterant. A whitening for chrome leather neutralization consisted of gypsum, and was therefore totally useless for its purpose. A study of oak and chestnut trees showed that chestnut bark contained at least as much tannin as oak bark, and chestnut wood, in contradistinction to oak wood from trees of the same age, contained appreciable amts. of tannin.

F. L. SEYMOUR-JONES

Shark leather. W. EITNER. *Häute- u. Lederberichte* 1920, No. 24; *Collegium* 622, 46-8 (1922); cf. *C. A.* 7, 4094.—A description of the peculiarities and methods of tanning shark skin. Shark leather has a high tensile strength, toughness, and resistance to wear. Fish skins consist of epidermis, corium major, and corium minor. In most cases the epidermis is an unorganized mucus layer. Unlike reptiles, fish scales form the outer layer of the corium major, i. e., the grain. The hide fibers lie in parallel layers crossing each other, giving great strength but little flexibility. The fibers of the fresh or salted hide are mostly collagenous and are very susceptible to the action of alkalis, alk. sulfides, acids, and enzymes, easily putrescing with the latter. Their resistance increases on drying. Soaking must be done in fresh water sharpened with soda. Liming should be in straight, fresh limes. The hides may be bated with oropon at a temp. below 25°, or bran drenched. Unfermenting tannins, e. g., quebracho, chestnut wood, or cutch, and sweet liquors should be used. Chrome tanning is unsuitable owing to the destructive action of acids. The shagreen is removed by splitting or with a carborundum wheel. In fat liquoring large amts. of mineral fats can be employed. Details of the manuf. of shark leather for sole, upper, belting, bag, and fancy leather are given.

F. L. SEYMOUR-JONES

The fate of soaps in chrome leather. IMMENDÖRFER AND PRÄHLER. *Chem. Umschau* 29, 73-4 (1922).—Alc. of 96% exts. from a dry 2-bath leather 63-85% of free oleic acid, the remaining 37-15% showing the presence of Na oleate and free S. A 1-bath leather had absorbed part of the alkali of the soap, which could be completely recovered in the form of Na_2SO_4 . A 1-bath leather from which the acid had been washed out with NaHCO_3 yielded to neutral alc. 38% free and 48% combined oleic acid while a leather that had been washed by NaOH yielded 74% free and 10% combined oleic acid.

P. ESCHER

Degreasing skins. E. ANDREIS. *Cuir* 11, 158-63(1922).—The degreasing of goat, sheep and pig skins is usually carried out after tanning, thus necessitating a retannage to fill up the spaces where the skin fats had inhibited tannage. It is difficult to obtain an evenly tanned product and trouble arises in dyeing. Skins should preferably be degreased while green or at latest after fleshing. The skin and wool fats are not simple triglycerides but consist of complex mixts. of fatty acids, esters like those in wax, unsaponifiables, myricyl or melinic, carnaubic, laurocerasic, and lanopalmitic acids, small amts. of volatile acids, and large amts. of higher alcs. (up to 40% of cholesterol and isocholesterol). Sheepskin fat is of the same nature as wool fat only it is liquid. A wool skin may contain up to 40% fat. Degreasing is usually accomplished by hydraulic pressing, twisting, or by extn. with petrol-ether or benzine, or by combinations of these methods. Extn. necessitates costly plant and a great fire risk. An app. based on a hone-degreasing plant is described, in which fleshed sheep or pig skins can be completely degreased with a mixt. of concd. EtOH and benzine. The process can be combined with depilating as the EtOH preserves the true skin while permitting the hair to be removed; strong depilatories may be used. A diagram of the app. is given.

F. L. SEYMOUR-JONES

A new orientation of our views on vegetable tannins. E. SCHELL. *J. Soc. Leather Trades' Chem.* 6, 137-8(1922).—See *C. A.* 16, 1881.

E. J. C.

The influence of the treatment of hide powder with formaldehyde on the adsorption processes in the analysis of vegetable tannins. O. GERNGROSS and H. ROSER. *Collegium* 622, 28-30(1922); cf. *C. A.* 16, 1335, 2041.—A com. tannin soln. was analyzed by the shake method with hide powder untreated, and lightly and heavily tanned with HCHO. The results showed tannin 19.77, 18.65, and 15.02% and water resistance, 5.2, 45.5, and 78.7%, resp. Similar samples of hide powder were subsequently chromed and used for the analysis of an oak wood ext. With the untreated powder the non-tannin filtrate gave no ppt. with the gelatin-salt test, the lightly HCHO-treated powder gave an opalescence, and the heavily treated powder a strong turbidity, and, on addn. of HCl, a ppt. Despite the large excess of hide powder all tannin is not removed from soln. It is recommended that the water resistance of hide powder for analysis (treated with HCHO as at present in Germany) should not exceed 10-20.

F. L. SEYMOUR-JONES

The basicity of chrome liquors. TH. KOERNER. *Ledertech. Rundschau* 1921; *Cuir* 11, 22-4, 42-3, 50-61, 102-3, 150, 163(1922).—A review of the different methods of calcg. and altering basicity, according to those proposed by Procter, Schorlemmer, Blockey, and others. Numerous examples of calcns. are given, including cases where both Al and Cr are present in the liquor.

F. L. SEYMOUR-JONES

Application of ion-concentration measurements to the control of industrial processes (KUEBLER) 1. Cementing leather, etc. (Brit. pat. 176,073) 18. Dyeing leather, etc. (U. S. pat. 1,414,029) 25. Bleaching gelatin (U. S. pat. 1,412,523) 12.

Treating hides and skins with liquids. C. J. GLASEL. U. S. 1,414,404, May 2, 1920. Hides or skins to be treated with tanning solns. or other liquids are mechanically flexed while fastened within a rotating drum provided with trunion piping for supply and withdrawal of solns.

Tanning. T. B. CARMICHAEL and W. H. OCKLESTON. Brit. 175,329, Oct. 1, 1920. Hides and skins are subjected to a preliminary tanning by a mixt. of HCHO and NaHSO₃ in soln., and are afterwards tanned by pyrogallol, catechol, or other tanning agents, pptn. of which is prevented by the preliminary process. Cf. 173,788.

Tanning. T. B. CARMICHAEL and W. H. OCKLESTON. Brit. 175,362, Nov. 1920. After mineral or vegetable tanning, hides are soaked in an aq. soln. of pyridine to fix the tanning elements and permit subsequent washing and rapid drying without sweating or exudation to cause streaking or discoloration. The hides are usually soaked for 4 to 12 hrs. in a 10–15% soln. of pyridine. In the case of vegetable-tanned hides, subsequent washing is effected in a 5% soln. of oxalic acid or in weak aq. solns. of other org. or inorg. acids, such as formic acid or H_2SO_4 . The application of the treatment to chrome and alum tanning processes is referred to.

Tanning. Soc. DU FEUTRE. Brit. 175,620, Feb. 9, 1922. Hides are soaked in slightly acidulated water before treatment with CaO in the hair-removing process, so that the hair or wool which retains a relatively large amt. of the acidulated H_2O by capillarity is not attacked by the CaO which nevertheless easily traverses the skin after neutralizing the acid held therein. The soaked hides are piled in pairs with their skin sides together, each pair being sepd. by a waterproof fabric to protect the hair from the CaO in the adjacent skin and are treated in the usual manner with a somewhat larger amt. of CaO.

Tanning. A. RÖMER and I. BLANGEY. U. S. 1,414,045, Apr. 25. An aromatic sulfonic acid such as that of dihydroxyditolylmethane (or a salt of such acids) is used for tanning.

Tanning composition from waste sulfite liquor. C. SORGER. U. S. 1,414,312, Apr. 25. The thickened sulfite liquor is treated with sufficient Na_2SO_4 and H_2SO_4 to ppt. all the liginosulfonic acid as the Na salt and the soln. is dialyzed.

Pyridine in tanning. W. H. OCKLESTON and T. B. CARMICHAEL. U. S. 1,413,488, Apr. 18. Pyridine is used after ordinary tanning as a fixing agent followed by a 5% oxalic acid soln. or other acid washing soln.

Treating shark skins. A. ROGERS. U. S. 1,412,968, Apr. 18. The dermal armor is removed from shark skins by successive treatment with a strong soln. of niter cake and with NaCl soln.

Greasing leather. O. RÖHM. U. S. 1,414,044, Apr. 25. A vegetable oil, such as castor oil, treated with 0.5–1% H_2SO_4 and neutralized with NaOH or KOH is employed for greasing leather and in oil tanning.

Dyeing leather. R. PHILLIPS. Brit. 175,250, Dec. 14, 1921. Vegetable or mineral tanned leather is treated with a soln. of one or more aromatic sulfonic acids, one or more condensation products of an aromatic sulfonic acid with an aldehyde, or with a mixt. of these compds. preparatory to dyeing with the ordinary dyes. When an acid dye is used, the compds. may be introduced into the dye bath, but when basic dyes are used, the leather is thoroughly washed after treatment in the bath and before introduction into the dye. As an example, chrome-tanned leather is immersed in a 5–10% aq. soln. of the condensation product of phenolsulfonic acid and HCHO, the soln. contg. 1–5 lb. of the compd. to 100 lb. of leather, until the desired penetration is obtained. The leather is then washed and dyed.

Fabric-coating composition for making "artificial leather." J. E. BOOCE. U. S. 1,412,770, Apr. 11. A nitrocellulose jelly is prepd. with blown cottonseed oil and mixed esters of MeOH or EtOH with the fatty acids of coconut oil which tend to prevent "cold-cracking" of the coating.

Increasing the durability of leather and strings of musical instruments. ROKURŌ ISOKAWA. Jap. 38,785, June 2, 1921. Addn. to 36,498. A paint prepd. by mixing a soln. of 5 g. nitrocellulose and 2 g. bakelite in 50 g. abs. MeOH or Me_2CO and a soln. of 2 g. copal and 1 g. castor oil in 20 g. abs. alc. is used to coat the leather or strings.

Glue-precipitating condensation products. A. LUTTREINGHAUS and L. BLANOGY. U. S. 1,412,949, Apr. 13. A soln. of cellulose in concd. H_2SO_4 is treated with C_{10}H_8 as long as sulfonate is formed by the addn. and the product is then poured into H_2O , neutralized with $\text{Ca}(\text{OH})_2$, sepd. from CaSO_4 and converted into the Na salt with Na_2CO_3 . The compn. thus prepd. is adapted for use as a mordanting, tanning or lake-forming agent. Similar products may be obtained by the use of starch, dextrin or sugars instead of cellulose and by the use of methylnaphthalene, chloronaphthalene, naphthalenesulfonic acids, anthracene, phenanthrene or carbazole instead of C_{10}H_8 .

